Geothermal Working Group Report

Evaluating geothermal energy as the primary resource for baseload power in the County of Hawaii

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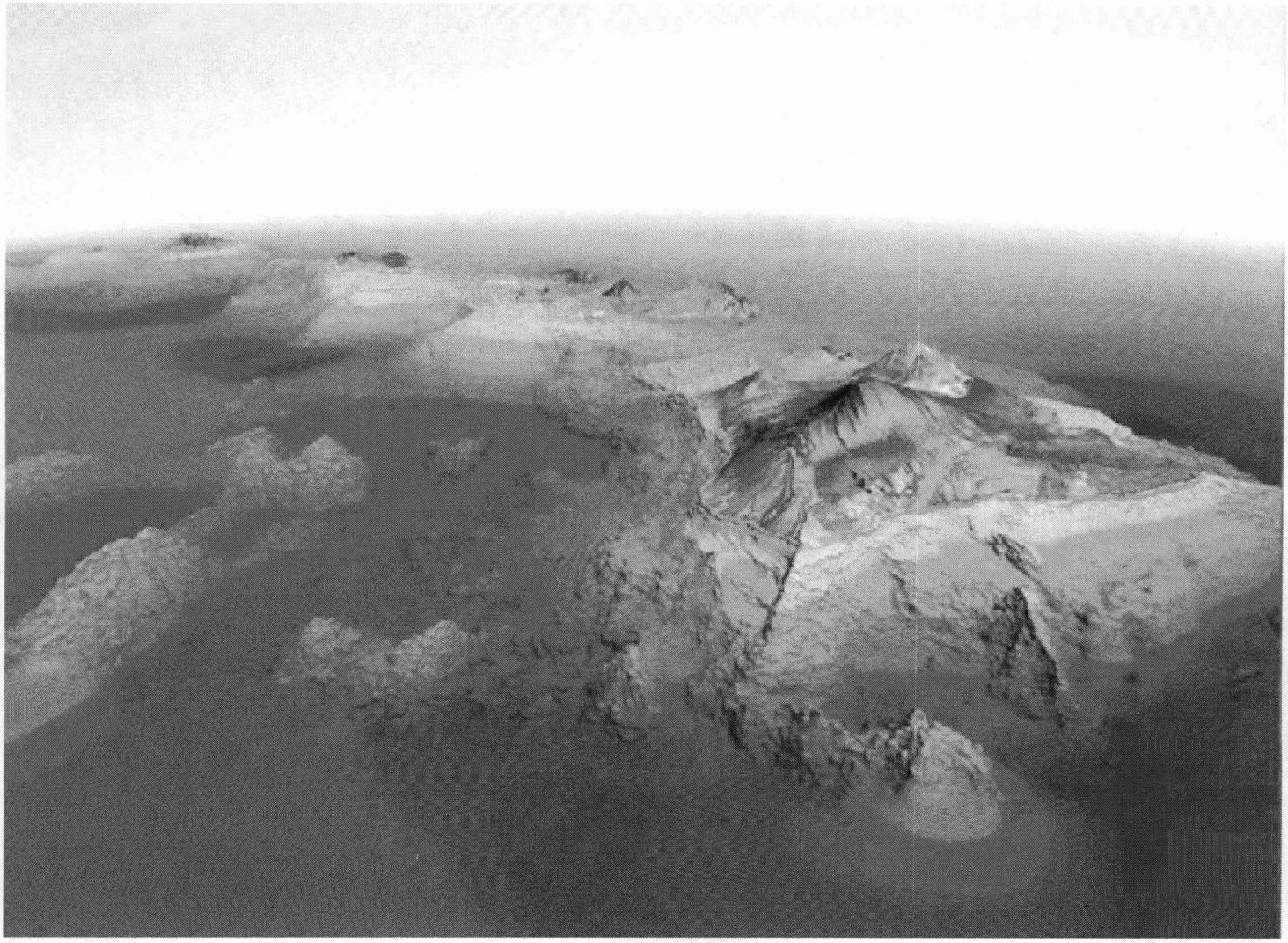

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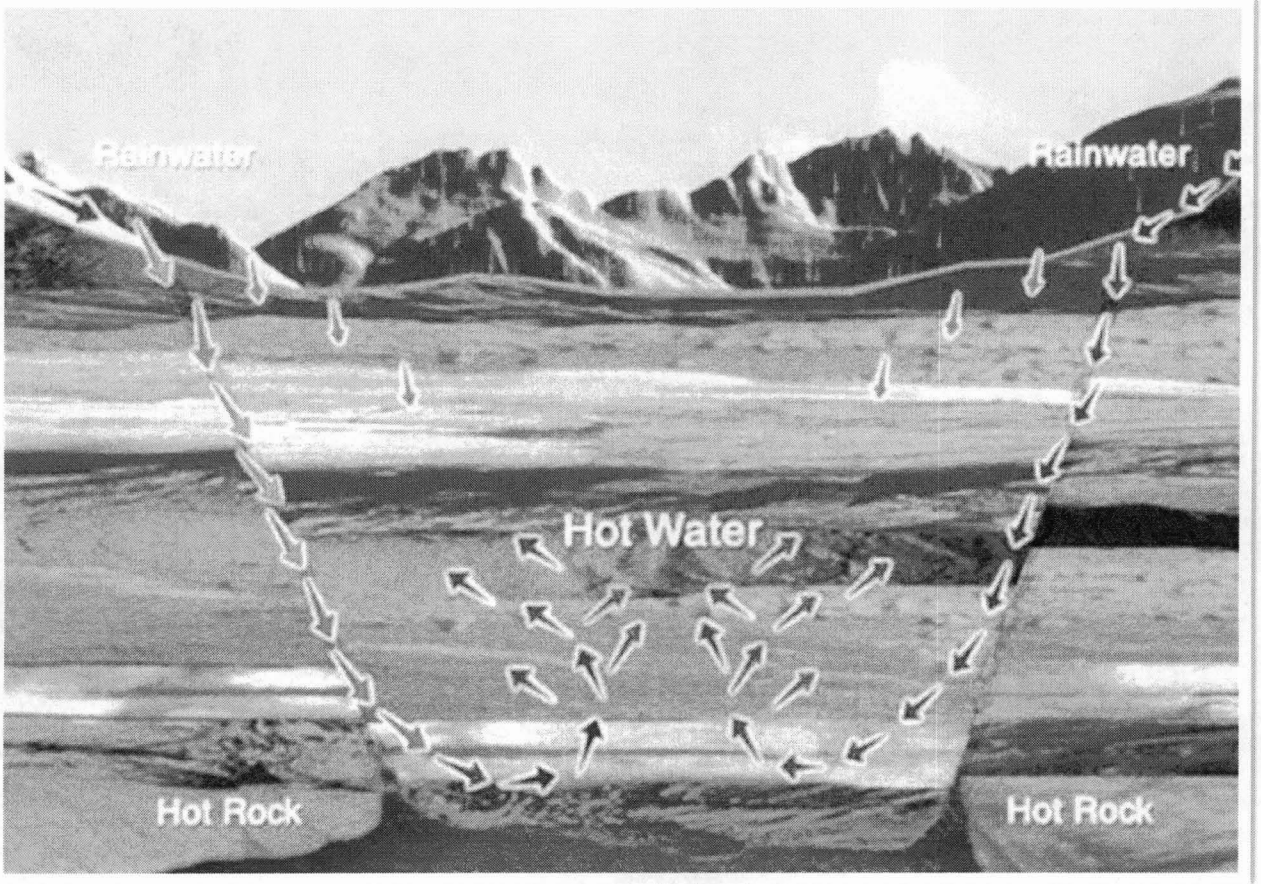

Natural geothermal reservoir

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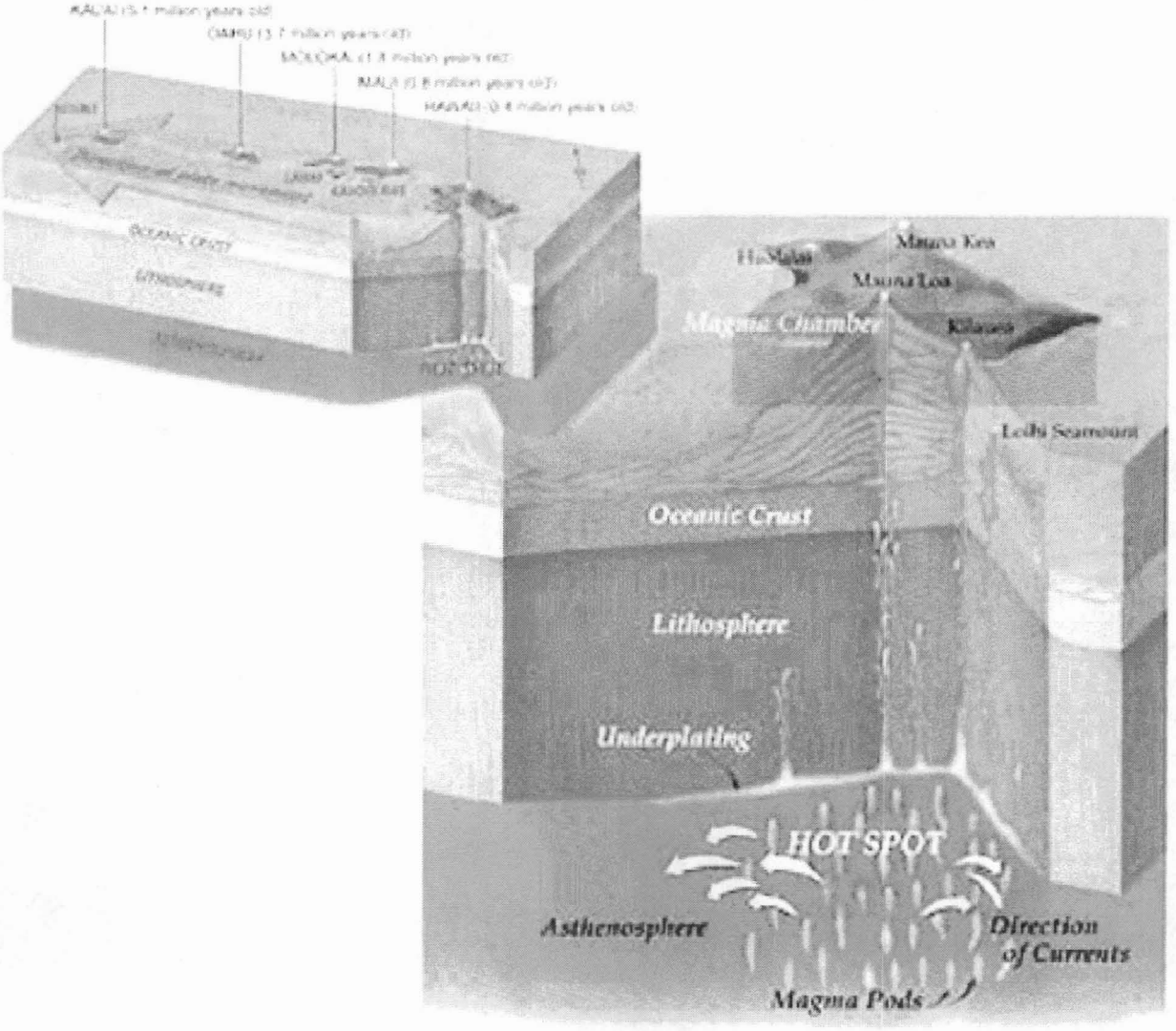
I. Executive Summary

SCR 99 established the Geothermal Working Group to evaluate geothermal energy as the primary source of baseload power for electricity in the County of Hawaii. An analysis of technical data and of expert testimony provides convincing rationale to develop local renewable energy plants and transition away from the county's dependence on petroleum-fueled generators for baseload electricity. Each stage of development must consider public safety and environmental concerns. Funding for research is required to ensure that the transition never harms people, property, or wildlife and that a robust and reliable supply of energy is always available. It is critically important to the welfare of all Hawaii residents that we begin to develop local energy immediately.



Hawaii's geological access to Earth's energy

The Geothermal Working Group's principal findings:

- Geothermal is a renewable resource indigenous to the island of Hawaii that is dissociated from the price volatility of petroleum fuels.

- Geothermal can be a key component in a diversified energy portfolio for Hawaii County, both for the electrical grid and for transportation.

- In Hawaii, geothermal is a firm-energy resource at lower cost than fossil fuel.

- Developing multiple geothermal plants is the most prudent approach.

- Geothermal has the potential to supply baseload electricity; long term reliability and the ability to supply grid management services (currently supplied by conventional fossil-fueled power plants) must be demonstrated in order to consider geothermal as the primary energy resource.

- With geothermal power plants, agricultural fertilizers, hydrogen, oxygen, and business-enterprise power can be produced for off-peak rates during the hours of curtailed electrical demand.

Charging station for electric vehicles

II. SCR 99 and Corresponding Report Sections

BE IT RESOLVED *by the Senate of the Twenty-fifth Legislature of the State of Hawaii, Regular Session of 2010, the House of Representatives concurring, that the County of Hawaii is requested to establish, convene, and facilitate a working group to analyze the potential development of geothermal energy as the primary energy source to meet the baseload demand for electricity on the Big Island*

See:
Appendix A Senate Concurrent Resolution 99, Sponsor: Russell S. Kokubun
Appendix B Composition of the Working Group
Appendix C Geothermal Working Group Minutes

BE IT FURTHER RESOLVED *that the working group consist of eleven members with the Mayor of Hawaii County designating the chairperson, including:*

The Hawaii County Energy Coordinator, or designee;
One member designated by Hawaii Electric Light Company;
One member designated by the Big Island Labor Alliance;
One member designated by the Hawaii Island Economic Development Board, Inc.;
One member designated by the Chairperson of the Public Utilities Commission;
The Hawaii Island Office of Hawaiian Affairs Trustee, or designee;
One member designated by the Director of Business, Economic Development, and Tourism;
One member designated by the Chairperson of the Board of Land and Natural Resources;
One member who is a representative of a non-profit, environmental group to be selected by the President of the Senate;
One member who is a representative of a cultural organization to be selected by the Speaker of the House of Representatives; and
One member representing West Hawaii to be selected by the Mayor of Hawaii County;

See:
Appendix B Composition of the Working Group

BE IT FURTHER RESOLVED *that the working group consider the potential impacts of expanding geothermal energy production on native habitats, pristine forest environments, and native Hawaiian values and practices, and recommend mitigative measures to ameliorate any adverse impacts that may be caused by geothermal energy production expansion*

See:
Environmental Impacts

BE IT FURTHER RESOLVED *that the working group also consider what improvements may be required for the electricity transmission system and what funding may be available for such projects from the United States Department of Energy*

See:
Infrastructure and Engineering Considerations

BE IT FURTHER RESOLVED *that the working group is requested to include a feasibility and cost-benefit analysis of using geothermal energy as the primary energy source to meet baseload demand on the Big Island, including an analysis of community, environmental, and economic benefits*

See:
The Cost of Energy
Community Benefits
Royalties Disbursement

BE IT FURTHER RESOLVED *that any community benefits analysis include the possibility and feasibility of establishing a community benefits package that includes the distribution of royalties derived from geothermal energy production to impacted communities, and strategies to avoid passing costs onto the customer*

See:
Community Benefits
Royalties Disbursement
Appendix D Activities to Date
Appendix L Warranty Deed and Grant of Access Easement, July 11, 2006
Appendix M Memorandum of Agreement Between the Department of Land and Natural Resources, State of Hawaii and the Office of Hawaiian Affairs

BE IT FURTHER RESOLVED *that the working group is further requested to include a detailed accounting of the geothermal royalties collected by the State, the County of Hawaii, and the Office of Hawaiian Affairs, including how those entities distribute and use the royalties*

See:
Royalties Disbursement

BE IT FURTHER RESOLVED *that the County of Hawaii is requested to provide an interim report to the Legislature no later than twenty days prior to the convening of the 2011 Regular Session, and the final report of the working group to the Legislature no later than twenty days prior to the convening of the 2012 Regular Session*

See:
Geothermal Working Group Interim and Final Reports

BE IT FURTHER RESOLVED *that certified copies of this Concurrent Resolution be transmitted to the Governor, the Chairperson of the Board of Land and Natural Resources, the Director of the Department of Business, Economic Development, and Tourism, the Chairperson of the Office of Hawaiian Affairs, the Mayor of Hawaii County, the Chairperson of the Hawaii Island Economic Development Board, Inc., the Chairperson of the Public Utilities Commission, the President of the Hawaii Electric Light Company, and the President of the Big Island Labor Alliance*

Coordinated through Hawaii County Mayor's Office Administrative Services

Hawaii's geothermal power plant produces 30 megawatts of power

Overview

Geothermal energy can be developed to become the cheapest form of baseload power for Hawaii County. There are no importation or storage costs. Using geothermal as the primary source of baseload power will permit the county's businesses to be more competitive with the rest of the world. Using geothermal as the primary source of baseload power will also help folks on the lowest rungs of the economic ladder—those who struggle with the cost of services.

In addition to stability and affordability, geothermal can leave less of an environmental impact than the commercially-available baseload power sources of electricity. There are no greenhouse gases, emissions and no oil spill risks.

The lower rates of off-peak geothermal electricity encourage the production of ammonia locally. Ammonia is an efficient hydrogen carrier that can be used to power internal combustion engines and as an aid to local agriculture as fertilizer. Light-industry business parks constructed near geothermal energy plants can use excess heat as a resource for heating vegetable and tropical flower hothouses, drying wood, and drying fish.

Benefits of geothermal energy to the community include sharing in geothermal royalties. In accordance with state law, the geothermal royalties are paid directly to the Department of Land and Natural Resources who allocate the royalties in three ways:

1. Department of Land and Natural Resources receives 50%
2. County of Hawaii receives 30%
3. Office of Hawaiian Affairs (OHA) receives 20%

Potential adverse impacts are listed below:

- Interference with worship of the Goddess Pele
- Interference with certain Native Hawaiian practices
- Rainforest destruction
- Possible health and safety impacts
- Disruption of the way of life for nearby residents
- Hydrogen sulfide and other air quality issues
- Noise
- Increased strain on an inadequate infrastructure
- Impact on native fauna and flora

The amount of geothermal royalties paid to the State of Hawaii fluctuates each fiscal year, since power output and sales to HELCO vary.

FISCAL YEAR	TOTAL	STATE OF HAWAII	COUNTY OF HAWAII	OFFICE OF HAWAIIAN AFFAIRS
1995 & PRIOR	$788,611.86	$394,305.93	$236,583.56	$157,722.37
1996	$499,353.00	$249,676.50	$149,805.90	$99,870.60
1997	$546,431.00	$273,215.50	$163,929.30	$109,286.20
1998	$522,235.00	$261,117.50	$156,670.50	$104,447.00
1999	$426,698.00	$213,349.00	$128,009.40	$85,339.60
2000	$496,381.00	$248,190.50	$148,914.30	$99,276.20
2001	$717,658.00	$358,829.00	$215,297.40	$143,531.60
2002	$477,958.00	$238,979.00	$143,387.40	$95,591.60
2003	$82,295.00	$41,147.50	$24,688.50	$16,459.00
2004	$678,165.00	$339,082.50	$203,449.50	$135,633.00
2005	$969,980.00	$484,990.00	$290,994.00	$193,996.00
2006	$1,855,394.00	$927,697.00	$556,618.20	$371,078.80
2007	$1,839,083.00	$919,541.50	$551,724.90	$367,816.60
2008	$2,698,467.00	$1,349,233.50	$809,540.10	$539,693.40
2009	$3,137,486.99	$1,568,743.49	$941,246.10	$627,497.40
2010	$1,073,362.00	$536,681.00	$322,008.60	$214,672.40
Thru August 2011	$1,878,965.00			

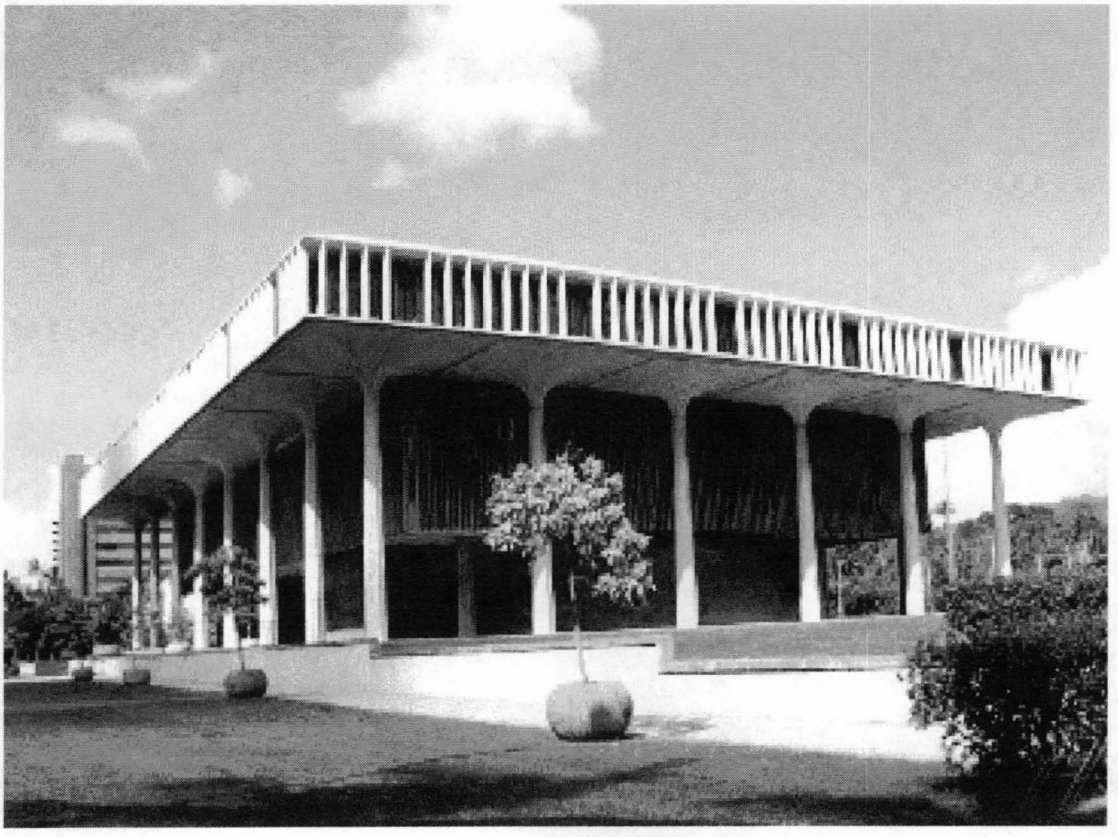
III. Geothermal Working Group Evaluations

The Geothermal Working Group advises a course of action that leads to energy independence and away from the dependence upon imported fuels. The Working Group advocates developing and producing a clean, renewable, and local energy portfolio that includes geothermal. Hawaiian Electric (HECO) vice president, Robbie Alm, wrote "Our state is 90 percent dependent on imported fossil fuels for all our energy needs. This is no longer sustainable. It threatens our energy and economic security and our environment.[1]"

There are no fossil fuel reserves in Hawaii. However, Hawaii does have natural and renewable energy resources. Using them can provide the means to lessen the impacts of an energy crisis.

Recently, HELCO performed high-level transmission studies to evaluate the expansion of geothermal generation. These studies provide a general appraisal of the transmission requirements for additional geothermal generation, but are not equivalent to the detailed interconnection studies required for specific projects.

[1] From PUC testimony, September 2011, see PUC.Hawaii.gov/dockets.



IV. Recommended Steps for Hawaii State Legislators

- Make the allocation of geothermal royalties more transparent to show how benefits come back to the community. Designate the records of the allocations to be public domain.

- Establish a community advisory board to offer suggestions to the DLNR about how royalties generated by geothermal power plants are spent. The advisory board should be members of the communities that host existing or future geothermal power plants and/or those who are most impacted by the development of geothermal energy.

- Encourage the DLNR to use geothermal royalties to identify promising geothermal sites and to further develop the resource.

- In light of the probability that oil will reach $200 per barrel (Lloyds of London), the legislature is requested to commission a study to show the economic impact of various prices of oil.

- Facilitate development of geothermal with a critical review of the geothermal permitting process, regulatory capabilities, and possible investment incentives.

Environmental Impacts

SCR 99 was mindful that geothermal energy development impacts adversely both the natural and cultural environment. It stated:

WHEREAS, previous geothermal development has raised sensitive issues regarding the impacts on native Hawaiian cultural and spiritual practices;

WHEREAS, Hawaii needs a sustainable energy market that strikes a balance between economic, community, and environmental priorities;

BE IT FURTHER RESOLVED that the working group consider the potential impacts of expanding geothermal energy production on native habitats, pristine forest environments, and native Hawaiian values and practices, and recommend mitigative measures to ameliorate any adverse impacts that may be caused by geothermal energy production expansion;

Potential adverse impacts are listed below:

- Interference with worship of the Goddess Pele
- Interference with certain Native Hawaiian practices
- Rainforest destruction
- Possible health and safety impacts
- Disruption of the way of life for nearby residents
- Hydrogen sulfide and other air quality issues
- Noise
- Increased strain on an inadequate infrastructure
- Impact on native fauna and flora

Hawaii laws say the exploration and development of geothermal resources can be permitted within conservation, agricultural, rural, and urban areas. That is because the vast majority of resources are located under volcanic rift zones and usually do not impact human activity on the surface. Because of volcanic hazards, geothermal potential is associated with predominantly rural areas most of the time and undeveloped lands where direct human impacts or occupation are minimal, such as the Wao Kele O Puna rainforest.

Industrialization of these rural or wilderness areas and the implementation of an industrial activity–the generation of geothermal power–is of major concern for those living adjacent to it or who value the biological diversity preserved in those areas.

1. The larger the quantity of geothermal energy developed, the larger the impacts to adjacent residents and the environment. Proponents of greatly expanded geothermal energy expound scenarios where major displacement of existing oil-fired electrical generation is achieved, with new high-energy input industries introduced on island to facilitate the transition. There has been no

analysis done by this Working Group on the environmental or social impacts of any large scale development scenarios.

2. It is apparent that under current assumptions, HELCO will not absorb more than another 10 to 20 MW of baseload geothermal energy in the near future (i.e. 2015). As stated, proponents of greatly expanded geothermal energy envision scenarios where total displacement of all oil-fired electrical generation (100 - 200MW or more of geothermal generated electricity) is practical, with a new high-energy input industry to absorb that energy until the electrical grid can be totally converted from oil-based fuels.

3. Prior to any expansion of geothermal facilities, members of this Working Group have asked that reviews of the air quality/hydrogen sulfide emissions rules, noise regulations relating to geothermal exploration, drilling operations, and production operations should be undertaken. Those are the environmental impacts that caused great alarm and objection in years past.

4. DLNR participation in future Working Groups is essential. They are a major influence in Hawaii's land use and management. They are tasked with geothermal subzone designation. That kind of review would be most beneficial in the education of potential "neighbors" on the slopes of Hualalai and/or the Kawaihae region.

5. Future review committees should seek input from DOH's regulatory divisions as well. They are ostensibly responsible for responding to neighbor complaints and overseeing air emissions and other pollutants. What is their current ability to handle and regulate and respond to emergency situations? What is their role during an emergency, either in Lower Puna or at a new geothermal site on the slopes of Hualalai and/or Kawaihae?

6. The Hawaii County Civil Defense and other County agencies play a role in the development of geothermal energy and mitigating its adverse environmental and social impacts. This Working Group did not interact with these County agencies. We encourage future Working Groups to do so.

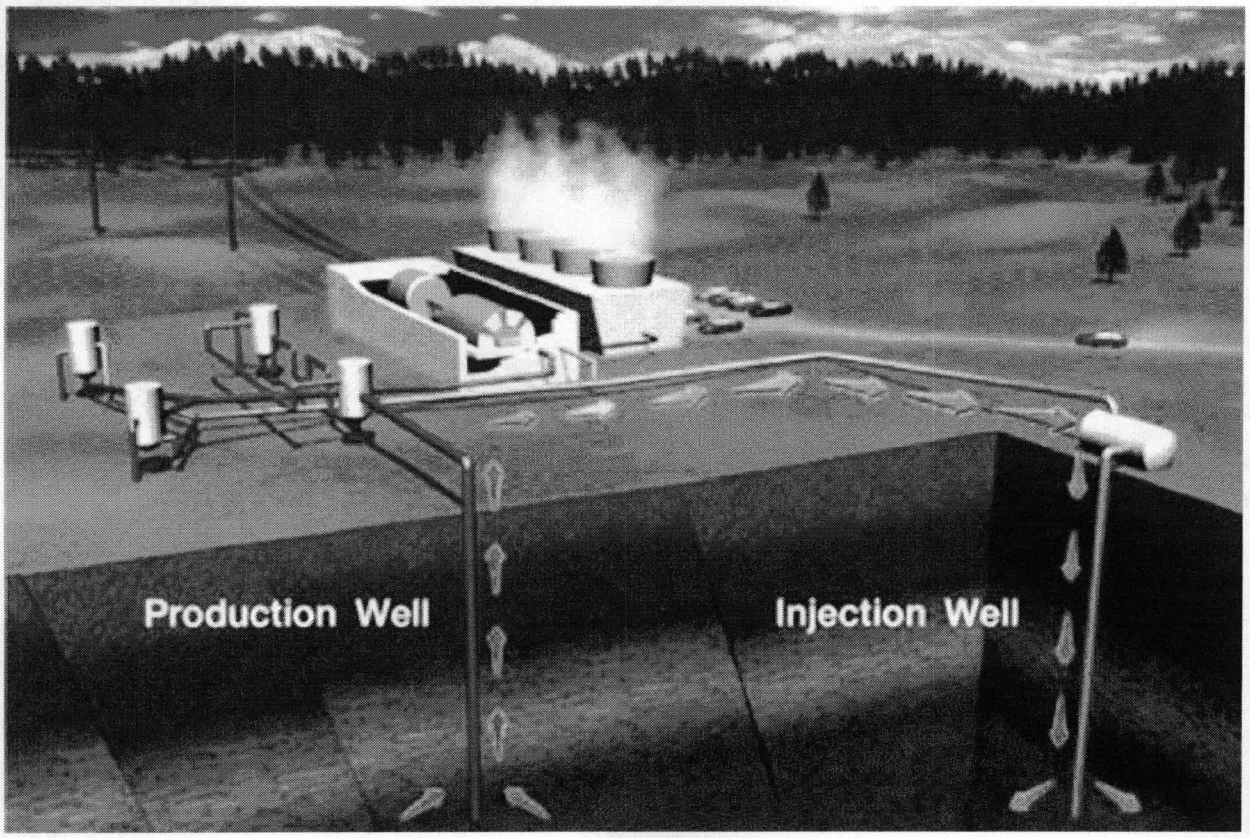
Since the environmental impacts are site specific, there can be no information on the impact without identifying the location of the resource or how it will be developed. The most critical issue is to identify the resources available. More testing is needed. The downside of the data available on Big Island's geothermal resources is that it is old and obtained using techniques that have been much improved in recent decades.

Resource Analysis and Impact Assessment

There are two projects the Working Group recommends be funded: first, testing and identifying specific locations that hold promise to be geothermal generation sites and, second, analyzing the impact of transition to geothermal upon the existing infrastructure. For example, shippers and dock workers may lose work importing supplies for petroleum-based plants. Funding for a study is needed and the Working Group recommends the legislation make it available.

A concern of neighbors to the geothermal plant in Puna is the need to plan for a possible malfunction in the plant's operation that might lead to a release of toxic gas. An Emergency Response Plan has been prepared and is updated from time-to-time. Copies of the ERP are distributed to all the responding agencies and available at the Pahoa Public Library. The working group recommends that the ERP be made available on-line for community review and information.

Some members of the Puna community insist that any expansion of PGV's capacity be done under the strictures of a contested case hearing. The Working Group is of the opinion that a robust environmental impact statement can mitigate community concerns. The contested case hearing is not recommended at this time.



Infrastructure and Engineering Considerations

Background Information

The electric transmission system on the Island of Hawaii is owned and operated by Hawaii Electric Light Company (HELCO), an investor-owned utility regulated by the Hawaii Public Utilities Commission. Hawaii Island has a land area of approximately 4,000 square miles with approximately 80,000 electric utility customers. The transmission system is primarily comprised of transmission lines built and operated at 69,000 volts. Currently, there are approximately 650 miles of transmission lines with 22 transmission substations on the Hawaii Island electrical grid.

HELCO's transmission system interconnects HELCO's major generation sites at Keahole (80.8 MegaWatts), Kanoelehua (55.2 MW), Puna (34.5 MW), Shipman (13.5 MW), and Waimea (7.5 MW), with major independent-power-producers at Hamakua Energy Partners L.P. (HEP - 60 MW), and Puna Geothermal Venture (PGV - 30.0 MW). Other *as-available* generation sites are also interconnected to HELCO's transmission system: Puueo Hydro (3.25 MW), Wailuku River Hydro (12.1 MW), Tawhiri Power LLC (Pakini Nui) Windfarm (21.0 MW), and Hawi Renewable Development, Inc. (10.56 MW). In addition, four dispersed-diesel units (1 MW each) are interconnected to the distribution system at the Panaewa substation, Kapua substation, Ouli substation, and Punaluu substation.

The majority of the firm-capacity power plants on HELCO's system are located on the eastern half of the island, while approximately half of the customer loads are on the western half of the island. HELCO firm-capacity power plants at Kanoelehua, Puna, and Shipman, and firm-capacity independent-power-producer plants at PGV and HEP are located on the eastern half of the island. HELCO firm-capacity power plants at Keahole and Waimea are located on the western half of the island. Net power generally flows from the power plants in the East to the load centers near Kailua-Kona on the westside.

There are four basic transmission routes for this cross-island power flow. Two transmission routes follow the path of Saddle Road between Mauna Kea and Mauna Loa, then through the South Kohala area on to Kailua-Kona. A third transmission route traverses from Hilo, through the northeast part of the island along the Hamakua Coast, through Waimea Town and then through the South Kohala area on to Kailua-Kona. The fourth route traverses from Hilo, through the Volcano area, through the South Point area, continuing through South Kona on to Kailua-Kona.

The HELCO transmission network allows for redundancy in the event of an outage to a line or system component. HELCO uses single-contingency criteria for the planning of its transmission system, meaning the system is designed to maintain normal voltages and line loading in the event a

single transmission line goes out-of-service. However, HELCO's transmission system is not designed to maintain normal voltages and line loadings should simultaneous outages occur in two or more transmission lines. Because such multi-line outages can result in large and serious system disturbances, proper operation and maintenance of HELCO's transmission system is vital to providing reliable service.

Transmission System Upgrade Study

A high level review of the transmission system upgrades required to interconnect additional geothermal power plants on Hawaii Island was done by Hawaii Electric Light Company. Two geothermal expansion scenarios were reviewed: one evaluated the addition of 50 MWs of geothermal energy from the East Rift zone and the second evaluated the addition of 50 MWs of geothermal energy on Hualalai on the West Side of Hawaii Island.

The evaluation concluded that for a 50 MW expansion on the East Rift zone, an additional transmission line from the new facility to Hilo, and an additional cross-island transmission line from the East side of the island to the West side would be required. For a 50 MW expansion near Hualalai, transmission lines from the new facility to existing transmission facilities on the West side of the island would be required but another cross-island transmission line would not be required.

HELCO's high-level transmission studies provide a general evaluation of transmission requirements for additional geothermal generation, but are not equivalent to the detailed interconnection study required for a specific project. More detailed interconnection studies would be performed at the time a geothermal-development project was identified and more specific size and location information was available. Cost estimates for interconnections would be developed at that time.

Note Regarding the Next Section of the Report

Many of the issues discussed in the next section, The Cost of Energy, will be evaluated in detail as part of HELCO's next Integrated Resource Planning process directed by the Hawaii Public Utility Commission.

The Cost of Energy

Geothermal generation on the Big Island

Geothermal energy has been an important source of electricity on the Big Island since the 30-megawatt (MW) Puna Geothermal Venture (PGV) plant began operation in 1993. PGV has been providing baseload power, generally between 25 and 30 MW—approximately 20% of the electricity delivered by HELCO.

Big Island residents have the highest use of their electricity in the evening, roughly between 6:00 and 9:00 p.m., when families are home at dinnertime. The peak demand on the Big Island is approximately 185 MW. During peak hours, as well as during the day when HELCO customers demand about 160 MW, HELCO usually purchases as much geothermal electricity as is available. Between midnight and dawn, however, electricity consumption is at its lowest, dropping to about 90 MW. During these hours, many Big Island power plants reduce their output, as there is no need for the electricity. The geothermal power plant is curtailed during these off-peak hours by several megawatts.

Geothermal power plants worldwide generally operate as baseload facilities; that is, producing a steady output 24 hours daily, seven days a week. Some facilities, such as PGV, do reduce output to "follow the load" during off-peak hours. However, geothermal wells are not turned on and off as power requirements change; steam is still produced, but if not used to generate electricity it bypasses the turbines and is simply injected back into the earth. Thus, there is some unused heat during the off-peak hours.

PGV's contract to provide electricity to HELCO was negotiated at a time when renewable electricity was tied to the price of oil. The current contract runs at least to December 31, 2027. It is not expected that future contracts for renewable electricity, including any for geothermal, would be tied to oil prices.

Potential benefits of increased geothermal power

Geothermal energy has a number of potential benefits for Big Island residents. Because it does not require imports of fossil fuel, it can contribute to more predictable and stable utility rates. This will be particularly important as oil becomes less available and more expensive.
The environmental impacts of producing, transporting, refining and using oil will also be reduced. The negative impacts of drilling for and shipping oil are currently "exported" to other countries, often affecting communities with environmental standards weaker than those of the US. Within Hawaii, we could expect to minimize oil spills and greenhouse gas emissions relating to burning fossil fuel.

Geothermal is a resource which is sustainable for centuries, given Hawaii County's geology. The heat resource is essentially inexhaustible. While individual wells or geothermal fields may change

over time, including changes in the proportion of liquid to vapor in the geothermal fluid, the presence of magma due to the "hot spot" beneath Hawaii ensures that heat will continue to be present in certain locations.

Also, although it is beyond the scope of the resolution, geothermal energy can provide more than just electricity. During off-peak hours, when Hawaii Island residents do not use as much electricity, geothermal heat could be used for a variety of other purposes, such as making liquid fuels, charging batteries, or supporting agricultural enterprises which require heat. These enterprises could contribute to Hawaii's clean energy future, and can also create jobs in addition to those needed to drill geothermal wells and operate the power plant.

State statute provides for the distribution of royalties paid by geothermal developers for the electricity they sell. Presently, 50% of the royalties are retained by the State of Hawaii Department of Land and Natural Resources, while 30% go to the County of Hawaii and 20% to the Office of Hawaiian Affairs. Additional electricity generation could provide more income to these agencies.

Pending additions to capacity

PGV and HELCO negotiated a contract for an additional 8 MW of capacity. If approved by the Public Utilities Commission, the contract would be highly unusual for a geothermal developer: it would allow for fully-dispatchable power. This means that HELCO operators would be able to control how much geothermal electricity is accepted on the grid, essentially allowing PGV's output to follow instantaneous changes in the load as well as providing peaking power. Additionally, the facility would add inertia to HELCO's system, which would help with grid stability. As is current practice, if steam from the geothermal wells is not needed for electricity, it will be injected into the reservoir. These additional 8 MW can be generated without additional production or injection wells being drilled.

In addition, PGV has obtained County and State permits to double its capacity to 60 MW, which would involve drilling additional wells. Though there is presently no demand for this amount of additional power on the Big Island, successful demonstration of fully dispatchable geothermal power could lead to more opportunities for expanded use of geothermal energy to meet existing demand.

The Big Island's geothermal resource

A number of assessments of the geothermal resource throughout the Hawaiian Islands have been conducted over the decades, with the most recent state-supported report produced in 2005. This report, "Assessment of Energy Reserves and Costs of Geothermal Resources in Hawaii," calculated the geothermal reserves for the state. Note that "reserves" is different from the total resource—estimates of reserves reflect the amount of recoverable heat energy anticipated to be present at drillable depths, while the total resource includes all underground heat and is a larger number.

Reserves were calculated for Big Island resource areas, including the Kilauea East Rift Zone (KERZ) as well as other rift zones. The combined minimum capacity for the Big Island is estimated to be 488 MW, but 1,396 MW is considered the most likely amount of reserves.

The calculation of reserves involves assumptions about the amount of heat which can be expected to be recovered at the surface and the efficiency of converting that heat to electricity. The calculation takes into account the reservoir area, its thickness, its average temperature, its average rock porosity, and other factors. It does not, however, imply that this energy can be exploited commercially.

It is highly likely that the commercially developable geothermal resource is smaller than the reserves. There is significant uncertainty regarding reservoir characteristics. In some areas, conditions may not support geothermal development; for instance, there may be heat but not sufficient fluid to transport the heat to the surface. In other areas, such as national parks, geothermal power plants cannot be developed.

The following table lists the estimated reserves for various Big Island rift zones, according to the 2005 assessment mentioned above. The smaller number is the calculated minimum capacity of the rift zone, with the larger number being the most likely capacity, reflecting the arithmetic mean. It should be noted that actual exploratory measures should be employed to confirm or modify these calculations. An updated assessment, including additional exploration, could provide more accurate numbers.

Puna Geothermal Venture has stated that they believe their leasehold in the lower KERZ is capable of producing 200 MW, which is consistent with the estimates given below.

Table 1.1 Estimated Geothermal Reserves, Island of Hawaii[1]

Rift Zone	Minimum capacity (MW)	Mean Capacity (MW)
Lower KERZ	181	438
Upper KERZ	110	339
Lower Kilauea SW Rift	64	193
Upper Kilauea SW Rift	68	201
Mauna Loa SW Rift	35	126
Mauna Loa NE Rift	22	75
Hualalai	7	25
TOTAL (rounded)	488	1396

[1] GeothermEx, Inc., 2005; *Assessment of Energy Reserves and Costs of Geothermal Resources in Hawaii.* Prepared for the State of Hawaii DBEDT.

The cost of geothermal electricity

Geothermal is a fully commercial renewable energy technology implemented in many countries around the world. The actual cost of geothermal electricity is currently significantly less than oil-generated electricity in Hawaii, in part due to the rising price of oil. For a 30-MW geothermal power plant in Hawaii designed to generate baseload power, the cost per kilowatt-hour is less than $0.10.

However, future costs will not necessarily be the same. For instance, should the additional 8 MW of load-following capacity come on line, the cost of generating a kilowatt-hour of electricity may be higher due to the ancillary services being provided.

The 2005 assessment provided an estimate of the levelized cost of power from a new 30-MW baseload geothermal power plant. The report made the following assumptions:

- Capital costs in the range of $2500-$5000/installed kW
- O&M costs in the range of $0.04-$0.06/kWh
- Initial drilling costs per well of $4 million to $9 million

With these assumptions, the mean levelized cost of power was calculated to be approximately $0.08 per kilowatt-hour.

Issues relating to expanding geothermal's baseload contribution

- PGV currently holds permits to double its output

Puna Geothermal Venture could double the capacity of its current power plant to 60 MW. However, currently there is no market for this amount of electricity on the Big Island.
Public hearings for the County of Hawaii's geothermal resource permit were completed years ago. At least some State of Hawaii permits are also in hand.

- How many, if any, additional permits are required?
- How many new production and injection wells will be needed?
- How many years would it take to develop another 30 MW of capacity?

- Other power plants currently provide baseload power

An existing independent power producer, Hamakua Energy Partners (HEP), has a 60 MW naphtha plant with a contract which runs from 2000 to 2030. HEP currently provides both capacity and electricity. It generates baseload power for HELCO, including during off-peak hours. Some HEP output is expected to be displaced by PGV's anticipated 8-MW addition as well as by the expected Hu Honua biomass-fired power plant in Pepeekeo, according to Jay Ignacio of HELCO (personal communication, Oct. 11, 2010.)

- Could additional geothermal capacity displace more generation from HEP?
- If so, what are the implications for the current contract with HEP?

- Existing fossil-fired utility power plants

Presently, HELCO distributes power from approximately 180 MW of generating capacity, including diesel and residual fuel oil plants around the island.

  - Which of these are scheduled for retirement?
  - How many years of economic life remain for each plant?
  - What is the financial impact of stranded investment on ratepayers and utility stockholders if any of the plants were decommissioned?
  - Could a new geothermal plant provide the stability and inertia presently provided by HELCO's fossil-fuel steam plants?

Challenges to increasing the proportion of electricity generated from geothermal energy

- "All eggs in one basket." There is strength and security in a diversified portfolio.
- Transmission issues. Presently, most of the electricity on the Big Island is generated on the east side, whereas the load is increasing on the west side. Electricity is lost during transmission, and transmission lines are subject to disruption.
- Mismatched demand. Demand (electricity use) is not well matched to geothermal's most cost-effective and technically mature application: 24/7 baseload production. Demand fluctuates throughout the day, whereas geothermal power plants are best suited to providing a steady output around the clock.
- Lack of market. Presently, HELCO does not need additional baseload power. HELCO does not anticipate needing more large power plants in the immediate future. If additional geothermal capacity were to be developed soon, it would require either displacing existing plants which have contracts for baseload electricity, or developing new markets—perhaps for non-electric uses of geothermal heat.

Possible actions to address these challenges

- Ensure that HELCO's portfolio remains diversified, ideally with a variety of renewable resources making significant contributions to the grid.
- Develop geothermal resources on the west side of the island to minimize transmission challenges and to generate electricity closer to where it will be used.
- Modify electrical demand to create markets for geothermal electricity during off-peak hours. This could include storing the energy in various forms, such as charging batteries, producing fuels such as hydrogen or ammonia, charging electric vehicles, or making ice for cooling applications during peak hours.
- Develop non-electric uses for off-peak geothermal energy, such as agricultural applications requiring heat—food or lumber drying, growing media pasteurization, biofuels production, and heating greenhouses. The County of Hawaii completed a feasibility study in 2007 which examined some of these applications[2].
- Explore the costs of contract buy-out and decommissioning existing power plants.

[2] Okahara & Associates, Inc., 2007. *Feasibility Study: Geothermal Direct Use, Kapoho/Pohoiki Area.* Prepared for the County of Hawaii Department of Research and Development.

Community Benefits

The PGV royalty is calculated according to the value of the resource using a formula developed by DNLR and the US Department of Interior; from that figure, 10 percent of the resource value is designated royalty. With regard to the royalties calculation and distribution, the Working Group recommends that Hawaii legislators revisit the way money is disbursed to the community. Moving forward, any expansion of geothermal would need to include a better package for fair compensation to the trust corpus of the ceded lands. The Hawaii State constitution clearly states "...proceeds and income derived on ceded lands (5f)..." are to be used to improve the conditions of the native Hawaiians as defined by the ACT. Hopefully, the mechanism can be developed by the legislature in concert with the local communities. Public hearings should be held to address all proposals being offered by all concerned.

The US Department of Energy is currently funding the development of several modifications to public transportation that will permit the transition from fossil fuels to hydrogen fuel for the Volcanoes National Park buses and the Hele-On trans-island bus service. Fuel-cell cars are being tested by the armed forces on Oahu and Big Island and will eventually support the establishment of refueling stations island-wide. The technology is available, but decades of subsidies, legislation favorable to the petroleum industry, and life-style choices by consumers has kept fossil fuel artificially profitable and has stymied the deployment of alternatives to gasoline-powered cars and buses. Transitioning to fuels that can be produced on Big Island and creating the attendant infrastructure of fueling stations and repair shops is strongly recommended.

Not only can geothermal power plants produce fuel for alternative-fuel power plants and vehicles, but also agricultural fertilizer that can replace products that are presently imported and expensive to farmers. Thus, the sale of fuel and fertilizer has the potential to become a major export business. Exporting hydrogen fuel in the form of ammonia from geothermal plants on Big Island to Oahu is one method of sharing the power resources with the population centers.

Insofar as as the usage of royalties from geothermal for community benefits has been masked by commingling the funds with other revenue streams provided to the Hawaii Department of Land and Natural Resources, the DLNR is requested to seek approval to direct monies received from geothermal funds to be used to explore and to identify promising geothermal sites and to further develop the resource. The change will permit an openness in accountability and allow the public to discern a prominent and unmistakable community benefit.

Additionally, a community advisory board should be established to offer suggestions to the DLNR about how royalties generated by geothermal power plants are spent in the future, especially after all the potential geothermal resource sites have been identified and tested.

The Board of Trustees (BOT) approves OHA's budget. The BOT has exclusive authority to decide how the "ceded lands revenue" is used to better the conditions of Hawaiians. Article XII, section 6 of the Hawaii State Constitution gives the Board the power to administer and manage "...all income and proceeds from that *pro rata* portion of the [SS 5(f)] trust referred to in section 4 of this article for native Hawaiians..." The Legislature's role is limited to quantifying Hawaiians' interest in the income and proceeds from the lands in SS 5(f) of the Admissions Act (refer to the Attorney General Opinion 03-04 regarding the Transfer of Ceded Land Receipts to OHA without Legislative Appropriation).

On June 27, 2006, OHA entered into an Agreement of Sale with The Trust for Public Lands (TPL) to purchase Wao Kele O Puna. The parties wish to preserve the property's natural and cultural resources and maintain traditional and customary practices through appropriate resource management. Funding in the amount of approximately $3.4 million was provided by the USDA Forest Service Forest Legacy Program and the balance was paid by OHA. No DLNR funds were used for the purchase.

Land Trust is a nonprofit organization as described in 501(c) of the Internal Revenue Code of 1986, that protects land by working with landowners who wish to donate or sell fee title or conservation easements to maintain conservation values associated with the land.

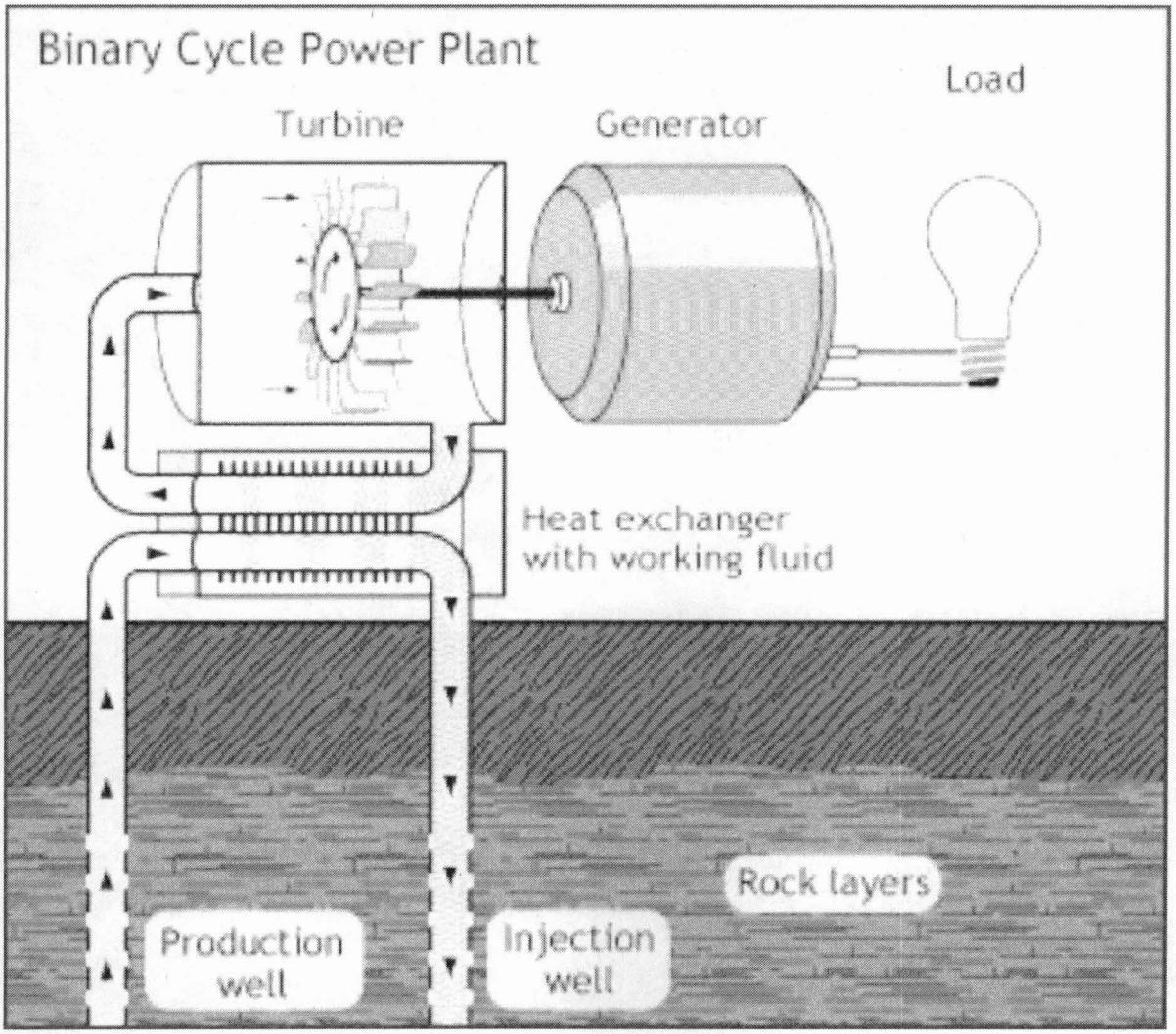
Use of the property complies with the Findings of Fact and Conclusions of Law and Final Declaratory Judgment/Injunction issued on August 26, 2002 in *Pele Defense Fund versus The Estate of James Campbell, Deceased, et. al*, Civil No. 89-089. The judgment opined that the owners of the land are not barred from and may seek to develop the undeveloped portions of the land consistent with applicable law. The developed areas as of January 1, 2001, are the access road, geothermal drill sites and areas cleared for geothermal drill sites. An advisory council consisting of the Pele Defense Fund and other interested community members, mutually selected by DLNR and OHA, developed a management plan.

The management plan included an inventory and assessment of natural and cultural resources, historical sites, risks, threats to resources, interpretive values, and economic development potential. The economic development-potential section identified uses consistent with the property's status as a forest reserve, the protection of traditional and customary uses of the site, sustainable use and protection of the resources of the site, and the terms of the Forest Legacy Program funding. The parties agreed to protect and enhance native plant and wildlife habitat, the natural, scenic and open-space nature of the property. The parties worked to plug an existing, but abandoned, geothermal well shaft on the property.

V. Geothermal Development in Hawaii

Geothermal can be a key component in a diversified energy portfolio for Hawaii County. Unlike solar and wind power, it is a "firm" resource—always there. Volcanic molten rock (magma) remains below Earth's crust, heating nearby rock, rainwater, and seawater that has seeped into the earth. Some of this hot water travels back up through faults and cracks and reaches Earth's surface as hot springs or geysers. Most of it stays deep underground, trapped in cracks and porous rock. This natural collection of hot water is called a geothermal reservoir.

Geothermal production wells bring the hot water to the surface and use its heat to vaporize a working fluid through a heat exchanger. The powerful expansion of the fluid from liquid to gas drives turbines that spin generators to produce electricity. Afterward, the hot water and gases are re-injected back into the injection zone below the water table. The working fluid is condensed and used again. This is a binary-cycle plant. The closed-loop circulation system means that no excess gases or fluids reach the open air.



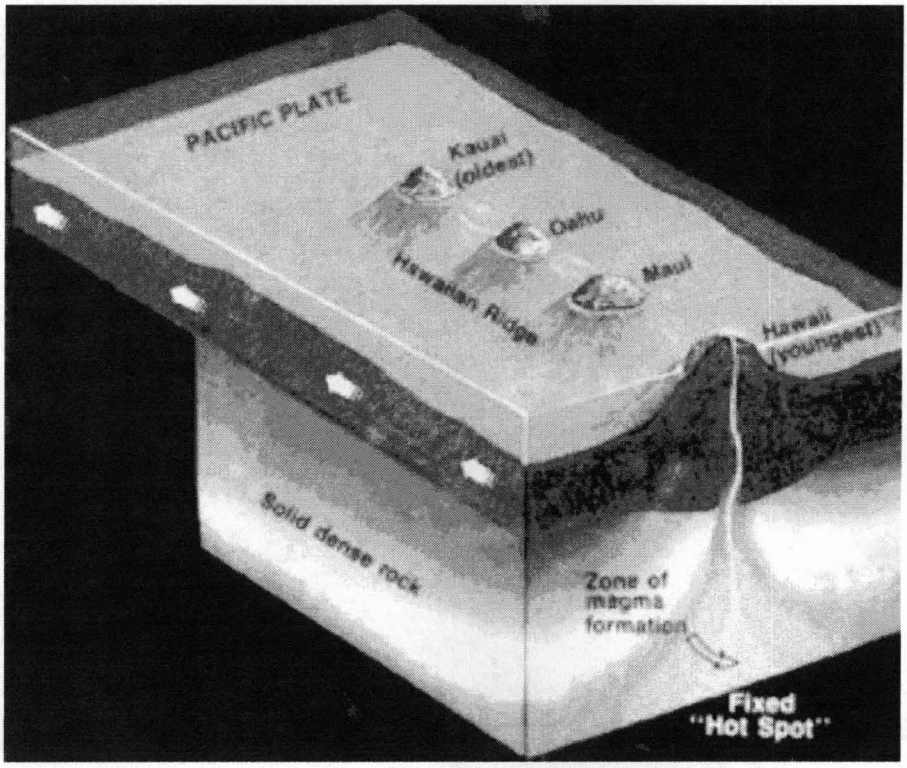
In 1993, the Puna Geothermal Venture Facility, located 21 miles south of Hilo on the Big Island, became the first commercial geothermal power plant in the state of Hawaii. Its binary-cycle plant produces about 30 megawatts of power, or 20 percent of the island's needs. That's enough electricity for 30,000 homes. PGV saves HELCO the equivalent of 144,000 barrels of petroleum a year. PGV is capable of expanding capacity and producing more power. Despite being restricted to the Big Island of Hawaii, geothermal produces thirty-one percent of Hawaii's renewable energy resources statewide.

The state has mandated that 20 percent of the electricity generated by public utilities comes from renewable sources by 2020. Yet, despite its efficiency, stability, and long-term viability, geothermal energy is not always the first consideration in the discussions of expanding energy resources. The public needs a greater awareness of geothermal energy to understand its potential.

Geothermal resources

Hawaii County lies above a geological *hot spot* in the earth's mantle that has been volcanically active for the past 70 million years. Big Island has had the most recent activity. Because of this, Hawaii County has immense potential for geothermal energy, both for electrical generation and fuel production. Geothermal power potential on the Big Island is estimated at between 500 and 700 Megawatts.

Geothermal interest has been motivated by the fact that imported oil is used to supply over 90 percent of Hawaii's energy needs; no other state in the U.S. is so critically dependent on imported oil. Geothermal is regarded as a renewable source and can help to make the island less dependent on imported energy.



VI. References to Subject-Matter Experts

Iceland report http://english.aljazeera.net/video/europe/2011/04/20114221651586099 2.html

While the vast majority of investment in the energy transition will come from the private sector, government has an important role in creating policies and incentives that encourage investment conditions.

Globally, geothermal exploration and drilling has, on average, a 50% or less success rate; it is very difficult to find commercial financing because of this risk. Hawaii has some major advantages, though: Hawaii has identified geothermal resource sites, state agencies are familiar with geothermal, there are local engineers with expertise, there are local educators with expertise, a local workforce is available, and the transmission lines are not far from the most promising resource sites. These factors make Hawaii a desirable location in the eyes of lenders, investors, and the renewable energy industry. Government can tip the balance in Hawaii's favor by offering appropriate incentives.

See ***Appendix O*** Barriers to Geothermal Development

The end of cheap oil is upon us. Given that Hawaii uses oil for 90% of its power, this is an urgent concern. Worse, the price of a barrel today is a false indicator of true reserves and future market costs; current conditions provide an unreliable basis for projections and planning. The uncertainty for businesses and government adversely affects all Hawaii residents.

See ***Appendix J*** Strategic Risks and Opportunities for Business

The use of petroleum in the world is now up to about 30 billion barrels per year. The rate at which we have found new supplies of petroleum over the last 10 years has fallen to an average of only about 10 billion barrels per year. We're obviously in an unsustainable situation. We are now using up a greater number of barrels that we have found in the recent past and that we have reserved in the ground. We are now beginning to use it up relatively quickly--with scary consequences for the future.

See ***Appendix H*** Charles Maxwell interviewed by Wallace Forbes

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference.

See ***Appendix I*** Association for the Study of Peak Oil & Gas Conference

The depletion of fossil fuels has been occurring since the first ton of coal or barrel of oil was mined. Since these fuels need about 100 million years to regenerate, depletion and technology are in a race. Furthermore, there is considerable evidence that we are mostly just pumping out old fields rather than replacing extracted oil with newly found oil. If current trends continue linearly, then in about two to three decades it will take one barrel of petroleum to find and produce one barrel of petroleum. Oil will cease to be a net source of energy.

The implications of this are obvious, huge, and make an argument for seeking substitutes earlier rather than later.

See ***Appendix G*** Energy Return On Investment by Dr. Charles A. S. Hall

The world is overwhelmingly dependent upon depleting supplies of fossil fuels. There is consensus among credible resource scientists and many economists that petroleum prices will rise to unprecedented levels in a few years. The cost? Volatile oil prices lead to the world-wide market collapse of 2008.

See ***Appendix J*** Strategic Risks and Opportunities for Business

One important goal of the Geothermal Working Group is to assess the minimum return-on-investment that must be attained from Hawaii's energy resources in order to support optimum social and economic activities. Hawaii suffers from an unfavorable return-on-investment for fossil fuel; the cost to drill, refine and deliver petroleum is three times greater than petroleum's benefit for use in utilities, farming, transportation, etc. The conclusion: using fossil fuel to power Hawaii is not sustainable.

See ***Appendix G*** Energy Return On Investment by Dr. Charles A. S. Hall

Government regulations can encourage investments in new energy

Source: http://oilprice.com/Alternative-Energy/Renewable-Energy/The-Need-for-a-Real-Domestic-Alternative-Energy-Policy-in-the-USA.html

Alternative energy (or renewable energy) is a new manufacturing industry paradigm that is in its infancy. However, the discussion is not new, and it looks as if the United States has positioned itself to be *behind history*.

After the oil shortages in the 70's, government officials began discussing energy policy as a matter of national security, but this misses the point of a globally competitive economic world. What is needed now (and what will aid in rebuilding the economy), is a change in paradigm so that America will remain competitive in a rapidly changing economic climate.

In order for new industries to start up, protections against losses have to be guaranteed by the government so industry will take the risk of investing. Governments have the ability to hold and maintain debt even above yearly revenue in order to stimulate economic activity. The government has a duty to utilize tax revenue in order to secure American economic competitiveness.

Alternative energy: A boom industry that needs government stimulus

China now leads the world in installation of wind turbines and solar thermal systems. With a $211 billion investment in 2010 for renewable energy, it is on the rise and should not be discounted to have conversations about drilling in the Gulf of Mexico or whether or not the EPA should remain.

The overemphasis on tax cuts as the only way to spurn private business has become a mantra that is corrosive and harming American capabilities to deal properly with the economic crisis and get people back to work. Alternative energy is a boom industry that needs government stimulus in order to cover the initial losses that would be incurred by private industry.

Source: http://oilprice.com/Alternative-Energy/Renewable-Energy/The-Need-for-a-Real-Domestic-Alternative-Energy-Policy-in-the-USA.html

Analysis by Robert Rapier, author and energy consultant

Normally, consumers consider falling oil and gasoline prices to be good news. They have to pay less to fill up their tanks. And if the reason for that is that oil supplies are increasing at a rate faster than demand is increasing, it can indeed be a good situation for consumers, and good for the economy.

But here's the bad news: that is not the case today.

Oil prices fell to below $90 a barrel, their lowest level in six months. I think oil prices are likely to fall further in the short term, and gasoline prices won't be far behind. While this news alone does mean that consumers will get some relief, the broader picture is grim. The reason oil prices fell by so much is not because a lot of new production came online, but rather because the economy is very sick, and a lot of people are out of work. Economic activity continues to be weak, and that means demand for oil is expected to be weak. In short, not as many people can afford oil and the things made from oil.

However, oil is a global commodity, and some economies continue to boom. Therefore, I don't expect prices to go down and stay down. Growth in just China and India will see to that. The Long Recession hypothesis says that when there isn't much spare oil production capacity, growth in developing countries will tend to keep oil prices high. But high oil prices are a drain on economies that are highly dependent upon oil (like the United States). Thus, if oil dependent countries are in recession during a time that oil production capacity isn't growing (or worse, shrinking), they are going to have a pretty tough time coming out of that recession.

Or a simpler way to put it is this. It may be that the U.S. economy and America's per capita oil consumption of 23 barrels of oil per person per year can't grow in the face of $100 oil. But if countries like China and their 2 barrels of oil per person per year continue to grow while buying $100 oil, then we have truly entered a new paradigm. What may happen is that both China and the U.S. end up consuming 5 or 8 barrels per person per year, which could still grow China's economy, while the U.S. gets there by shrinking ours. China's growth is probably the most worrisome factor because we will be competing against them for global oil supplies.

Source: http://www.consumerenergyreport.com/blogs/rsquared/

GE Poll Source: http://www.genewscenter.com

Nearly eight in 10 US consumers — 79 per cent — say in a new survey that they're ready to make short-term changes in their energy use habits to gain longer-term benefits.

Commissioned by GE, the national survey found that 72 per cent believe that, left unchanged, today's energy sources and consumption habits could hurt the country's economic growth. And 63 per cent said they're willing to work with their power companies to help bring about changes in consumption patterns.

According to GE, the survey findings indicate that people in the US are ready to see changes in the nation's energy landscape.

"There are some things that are essential to achieving a desired quality of life, and Americans overwhelmingly agree that investing in our nation's energy future is one of them," said Bob Gilligan, vice president of digital energy for GE Energy Services. "The American electrical grid system has undergone little investment in the past 25 years. Even worse, most generation stations were built in the 1960s or earlier using even older technology. As a nation, Americans recognize that a cleaner, smarter and more efficient energy infrastructure will help create a competitive economic future. The key is to invest correctly — the right way rather than the easy way."

Association for the Study of Peak Oil & Gas Conference
Washington, DC (Platts News Service) - Leslie Moore Mira

"The global rate of production of oil is peaking now," said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin.

Frank Rusco, an energy director at the US Government Accountability Office, said, "The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper."

See ***Appendix I*** Association for the Study of Peak Oil & Gas Conference

Lloyd's of London White Paper

1. Energy security and environmental concerns will fundamentally alter the way that we manage and use energy.

2. Modern society has been built on the back of access to relatively cheap, combustible, carbon-based energy sources. That model is outdated.

3. China and emerging Asian economies demonstrated their buying power in the energy markets.

4. Energy markets will continue to be volatile as traditional mechanisms for balancing *supply and price* lose their power.

5. Much of the world's energy infrastructure lies in areas that will be increasingly subject to severe weather.

6. Without an international agreement on climate change mitigation, energy transitions will take place at different rates in different regions.

7. The introduction of *carbon pricing* and *cap and trade* schemes will make the unit costs of energy more expensive. The most cost-effective mitigation strategy is to reduce fossil fuel energy consumption.

8. Businesses must address the impact of energy and carbon constraints holistically, and throughout their supply chains. Tight profit margins on food products, for example, will make some current sources unprofitable as the price of fuel rises and local suppliers become more competitive.

9. The last few years have witnessed unprecedented investment in renewable energy and many countries are planning or piloting 'smart grids'. This revolution presents huge opportunities.

See ***Appendix J*** Strategic Risks and Opportunities for Business

The members of the Geothermal Working Group wish to acknowledge the administrative efforts of Christopher Westlye, who edited and arranged the Geothermal Working Group report.

Appendix A

Senate Concurrent Resolution 99
Senator Russell Kokubun

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THE SENATE.
TWENTY-FIFTH LEGISLATURE, 2010.
STATE OF HAWAII.

S.C.R. Number 99. FEBRUARY 26, 2010.

==========

SENATE CONCURRENT RESOLUTION.

REQUESTING THE ESTABLISHMENT OF A WORKING GROUP TO ANALYZE THE POTENTIAL DEVELOPMENT OF GEOTHERMAL ENERGY AS THE PRIMARY ENERGY SOURCE TO MEET THE BASE-LOAD DEMAND FOR ELECTRICITY ON THE BIG ISLAND.

WHEREAS, in 1881, King David Kalakaua visited Thomas Edison in New York to discuss extracting power from Hawaii's volcanoes and using underwater cables to carry power between islands; and

WHEREAS, at the time, his strategy did not prove to be feasible, and hydropower was used to generate electricity to light Honolulu; and

WHEREAS, today, technology advances make geothermal energy not only feasible, but a top source of renewable energy; and

WHEREAS, geothermal energy is a more reliable source of energy than solar or wind energy, because when the wind does not blow and the sun does not shine, the heat from the volcano continues to produce a steady flow of power; and

WHEREAS, Hawaii's ratio of renewable energy generation (ten percent) to fossil fuel generation (ninety per cent) ranks third in the nation; and

WHEREAS, the United States Department of Energy has indicated that Hawaii is one of the best positioned states for renewable energy potential; and WHEREAS, the United States Environmental Protection Agency asserts that greenhouse gases threaten public health and

science overwhelmingly shows greenhouse gas concentrations are at unprecedented levels due to human activity; and

WHEREAS, there is irrefutable evidence that global warming is real and occurring at an alarming rate, with rising sea levels and stronger and more frequent storms; and

WHEREAS, the designation and establishment of geothermal resource sub-zones more than twenty-five years ago needs to be reviewed to reaffirm or amend the original feasibility assessments; and

WHEREAS, previous geothermal development has raised sensitive issues regarding the impacts on native Hawaiian cultural and spiritual practices; and

WHEREAS, Hawaii needs a sustainable energy market that strikes a balance between economic, community, and environmental priorities; and

WHEREAS, the Hawaii Clean Energy Initiative aims to meet seventy per cent of the State's energy needs through renewable sources by 2030; and

WHEREAS, geothermal energy is efficient and stable, and has long-term viability to help Hawaii meet its 2030 goals, reduce its contribution to global warming, and create a sustainable energy market; and

WHEREAS, as a proven source of reliable firm capacity, geothermal energy has great potential to be the primary source of energy to meet the Big Island's base-load demand, generating the amount of power required to meet minimum electricity demands based on reasonable expectations of customer requirements; now, therefore,

BE IT RESOLVED by the Senate of the Twenty-fifth Legislature of the State of Hawaii, Regular Session of 2010, the House of Representatives concurring, that the County of Hawaii is requested to establish, convene, and facilitate a working group to analyze the potential development of geothermal energy as the primary energy source to meet the baseload demand for electricity on the Big Island; and

BE IT FURTHER RESOLVED that the working group consist of eleven members with the Mayor of Hawaii County designating the chairperson, including:

1. The Hawaii County Energy Coordinator, or designee;
2. One member designated by Hawaii Electric Light Company;
3. One member designated by the Big Island Labor Alliance;
4. One member designated by the Hawaii Island Economic Development Board, Inc.;
5. One member designated by the Chairperson of the Public Utilities Commission;
6. The Hawaii Island Office of Hawaiian Affairs Trustee, or designee;
7. One member designated by the Director of Business, Economic Development, and Tourism;
8. One member designated by the Chairperson of the Board of Land and Natural Resources;
9. One member who is a representative of a non-profit, environmental group to be selected by the President of the Senate;
10. One member who is a representative of a cultural organization to be selected by the Speaker of the House of Representatives; and
11. One member representing West Hawaii to be selected by the Mayor of Hawaii County; and

BE IT FURTHER RESOLVED that the working group consider the potential impacts of expanding geothermal energy production on native habitats, pristine forest environments, and native Hawaiian values and practices, and recommend mitigative measures to ameliorate any adverse impacts that may be caused by geothermal energy production expansion; and

BE IT FURTHER RESOLVED that the working group also consider what improvements may be required for the electricity transmission system and what funding may be available for such projects from the United States Department of Energy; and

BE IT FURTHER RESOLVED that the working group is requested to include a feasibility and cost-benefit analysis of using geothermal energy as the primary energy source to meet base-load demand on the Big Island, including an analysis of community, environmental, and economic benefits; and

BE IT FURTHER RESOLVED that any community benefits analysis include the possibility and feasibility of establishing a community benefits package that includes the distribution of royalties derived from geothermal energy production to impacted communities, and strategies to avoid passing costs onto the customer; and

BE IT FURTHER RESOLVED that the working group is further requested to include a detailed accounting of the geothermal royalties collected by the State, the County of Hawaii, and the Office of Hawaiian Affairs, including how those entities distribute and use the royalties; and

BE IT FURTHER RESOLVED that the County of Hawaii is requested to provide an interim report to the Legislature no later than twenty days prior to the convening of the 2011 Regular Session, and the final report of the working group to the Legislature no later than twenty days prior to the convening of the 2012 Regular Session; and

BE IT FURTHER RESOLVED that certified copies of this Concurrent Resolution be transmitted to the Governor, the Chairperson of the Board of Land and Natural Resources, the Director of the Department of Business, Economic Development, and Tourism, the Chairperson of the Office of Hawaiian Affairs, the Mayor of Hawaii County, the Chairperson of the Hawaii Island Economic Development Board, Inc., the Chairperson of the Public Utilities Commission, the President of the Hawaii Electric Light Company, and the President of the Big Island Labor Alliance.

Appendix B

Composition of the Working Group

The working group consists of eleven members with the Mayor of Hawaii County designating the chairperson, including:

1. The Hawaii County Energy Coordinator, or designee

Member: Richard Ha, President of Hamakua Springs Country Farms, co-chair of Working Group

2. One member designated by Hawaii Electric Light Company

Member: Jay Ignacio, President of HELCO

3. One member designated by the Big Island Labor Alliance

Member: Wallace Ishibashi, Jr., Big Island Labor Alliance, co-chair of Working Group

4. One member designated by the Hawaii Island Economic Development Board, Inc.

Member: Barry Mizuno, HIEDB

5. One member designated by the Chairperson of the Public Utilities Commission

Member: David Mattice, Hawaii County PUC representative

6. The Hawaii Island Office of Hawaiian Affairs Trustee, or designee

Member: Robert Lindsey, Hawaii Island OHA trustee

7. One member designated by the Director of Business, Economic Development, and Tourism

Member: Andrea T. Gill, Renewable Energy Specialist, State of Hawaii

8. One member designated by the Chairperson of the Board of Land and Natural Resources

Member: DLNR- Did not send a representative

9. One member who is a representative of a non-profit, environmental group to be selected by the President of the Senate

Member: Nelson Ho, Chair of the Moku Loa Group (Hawaii Island), Sierra Club

10. One member who is a representative of a cultural organization to be selected by the Speaker of the House of Representatives

Member: Patrick Kahawaiola'a, President of the Keaukaha Community Association

11. One member representing West Hawaii to be selected by the Mayor of Hawaii County

Member: Jacqui Hoover, executive Director HLPC-West Side Representative

NEIL ABERCROMBIE
GOVERNOR

HERMINA MORITA
CHAIR

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COMMISSIONER

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October 12, 2011

Mr. Richard Ha, Co-Chair
Mr. Wallace Ishibashi, Co-Chair
Geothermal Energy Working Group

Dear Chairs Ha and Ishibashi and Members of the Geothermal Working Group:

As the Chair of the Hawaii Public Utilities Commission ("PUC"), I request that clarification of the PUC's participation in the development of the final report of the Geothermal Energy Working Group ("working group") be added to the appendix of the final report.

Senate Concurrent Resolution No. 99, Session Laws of Hawaii 2010, names one member designated by the Chairperson of the PUC. It is my understanding that Commissioner Carlito Caliboso attended the meetings with the intent of acting as a resource to the working group. Upon my becoming Chair in mid-March 2011, I designated the PUC Hawaii Island Representative, David Mattice, to attend on behalf of the Chair to mainly observe rather than actively participate in the meetings.

I truly appreciate the dedication and efforts of the working group, however, given: (1) the PUC's role as the regulatory agency presiding over any resulting power purchase agreement for geothermal energy, and (2) the likelihood that other geothermal issues will be adjudicated by the PUC in the future, I did not feel it would be appropriate for the PUC to comment on the specific findings and recommendations of the working group. Therefore, clarification within the final report is requested to ensure that listing the PUC as a working group member will not be misconstrued as the PUC taking an active role in the development and adoption of the specific findings and recommendations of the working group prior to the PUC presiding over any resulting project power purchase agreement.

Thank you for your consideration in this matter.

Sincerely,

Hermina Morita

Hermina Morita
Chair

HM:CPA:ac

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William P. Kenoi
Mayor

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25 Aupuni Street
Hilo, Hawai'i 96720

Wednesday, June 2, 2010
Office of the Mayor

CALL TO ORDER

The inaugural meeting was called to order by Co-Chairman Richard Ha at 3:10 p.m. Co-Chairman Ha introduced Mayor Billy Kenoi.

PRESENT:

Carlito Caliboso
Richard Ha, Co-Chairman
Nelson Ho
Jacqui Hoover
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Ted Peck

GUEST SPEAKERS

Jose Dizon, HELCO
Mike Kaleikini, Puna Geothermal Venture
Mayor Billy Kenoi
Council Member Emily Naeole-Beason

Mayor Kenoi thanked everyone for their support of the newly formed Geothermal Energy Working Group. He acknowledged the presence of Councilwoman Emily Naeole-Beason.

Mayor Kenoi stated that everyone recognizes that energy and its cost moving forward determine the quality of life for island residents. It is essential to address the importance of renewable and alternative energy development. He explained that the Hawai'i Clean Energy Initiative aims to have the State obtain 70 percent of its energy from renewable energy sources by 2030. If there is any community that will achieve that goal, it is the County of Hawai'i, because it is already at 32 percent.

Mayor Kenoi stated that in order to accomplish this goal it is necessary to maximize the availability and the opportunity that surrounds geothermal. Senate Concurrent Resolution 99 (SCR 99) directs Hawai'i County to establish a working group to analyze the potential development of geothermal energy making it cost effective and feasible. The Geothermal Working Group will consider the expansion of geothermal development and address its impact on the environment and its culture.

Mayor Kenoi stated that he feels confident that the members selected consist of talented individuals who will make significant and substantial strives in expanding and utilizing the "gift of geothermal."

Councilwoman Naeole-Beason offered a short prayer to spiritually guide the members in wisdom, knowledge, and understanding.

Councilwoman Naeole-Beason commented that she witnessed the process of geothermal and how it has evolved throughout the years. She supports the newly formed group and looks forward to the county providing new sites for geothermal. As a result of Puna geothermal, she is presently the only councilmember on Hawai'i Island who is capable of utilizing royalty funds to take care of her district. She hopes that in the future other Council districts will be able to benefit from geothermal.

Co-Chair Ha thanked everyone for supporting the newly formed Geothermal Energy Working Group. He explained that this working group will need to file an interim report with the Legislature prior to the start of its 2011 session. In the next seven months, the group is directed by SCR 99 to analyze the potential development of geothermal energy as the primary energy source that can meet the base load demand for electricity on the Big Island.

As a farmer, Co-Chair Ha stated that in the past he attended several seminars. He learned about the concept of energy return on investment, and the standards of rural oil supplies. Studies indicate that the end of cheap oil is near. Individuals who are less fortunate financially will be the most vulnerable. Co-Chair Ha explained that according to HELCO's website, geothermal energy costs approximately 11 cents per kilowatt hour for base power. Based on this figure, it is by far the cheapest form of base power. Geothermal is proven technology: it's cheap, it's a gift to use wisely, and it can be shared with future generations. Also, there are future possibilities to develop with geothermal including transportation, fertilizer, ammonia, etc.

Representing the Big Island Labor Alliance, Co-Chairman Wallace Ishibashi explained that in the 1980's he was a member of the first geothermal group called the Hawai'i Island Geothermal Alliance (HIGA). At that time, it was a touchy subject, however; over the course of time the first phase of geothermal has proven to be very effective, clean, and beneficial to Hawai'i island. Mr. Ishibashi said that he continues to take interest in the development of geothermal because "it is the right thing to do Geothermal energy is available in only certain regions of the world and Hawai'i Island is blessed to have this resource."

Co-Chair Ishibashi stated that the Hawaiian community may possibly have concerns regarding this issue. It is the Geothermal Energy Working Group's responsibility to address them openly with understanding and aloha. He said, "the fact is Pele is recognized as a living goddess to some Hawaiians in the community. It is important to acknowledge the communities issues with respect and understanding of their culture."

In order for geothermal to succeed, Co-Chair Ishibashi commented that the key is for businesses and the working class to see a difference in their electric bill. Once businesses receive savings, they can than afford to provide better wages to their workers. He also commented that many people believe that there is a price to pay in order to live in Hawai'i. Co-Chair Ishibashi stated that that way of thinking must change. The fact is that cheaper energy attracts better business opportunities for our islands. Geothermal will reduce the cost to Hawai'i residents and business operators. Therefore, the goal is to attract better business in Hawai'i because this cheap base energy will allow affordable living.

Co-Chair Ha asked that all members introduce themselves.

Patrick Kahawaiolaa introduced himself as the current president of the Native Hawaiian Community on Hawaiian Homelands. As a representative of the native Hawaiian community he would like to move forward with geothermal becoming a meaningful resource.

Nelson Ho introduced himself and stated that he got involved with geothermal energy in 1981. That is when 500 megawatts was proposed adjacent and upwind of Hawai'i Volcanoes National Park. He is interested in learning what new developments have transpired. In the past, some of the original concerns raised involved the demand. Those issues involved the cost of bringing in a new supply of energy, the efficiency and usage, and whether the environmental and cultural subsidies were sufficient in making geothermal economical as an energy resource.

Mr. Ho explained that there were a lot of constraints on geothermal energy. Those constraints are on the record and are historical. He would like to see if any of these issues have changed throughout the years. Also, he would like to know what the Public Utilities Commission's views are regarding this resource becoming the base load energy.

Jacqui Hoover introduced herself as a representative of West Hawai'i, she is involved with the Hawai'i Leeward Planning Conference and the Hawai'i Economic Development Board. She was born and raised on Hawai'i Island. Thereafter, she attended school in California. Ms. Hoover mentioned that she was involved with the early geothermal efforts in California and would like to see what opportunities exist in order to stabilize energy use on Hawai'i Island.

Carl Caliboso introduced himself as chairman of the Public Utilities Commission. He explained that the PUC's role is to regulate public utilities. In this case, this regulation will be directed towards HELCO. He personally encourages HELCO to consider and explore existing alternative energy sources like geothermal. The consideration of expanding geothermal is very interesting. The PUC has an interest in making sure that utility service provided to the community is reliable and offers reasonable rates to the consumer. Sometimes it is necessary to make an investment in a short term to have long term benefits. This is seen a lot with other renewable energy type options and investments that are being considered and proposed. Mr. Caliboso remarked that it is also important to be sensitive to many different concerns that are deeply rooted because that is why this taskforce was established.

Jose Dizon introduced himself as the general manager for operations at HELCO. He participated at the First Natures' Futures program symposium on Friday. At that symposium, he spoke about the challenges in Hawai'i involving social, cultural, and historical issues. Although there are many issues involved, Mr. Dizon stated that he does believe there is a way to make it work.

Barry Mizuno introduced himself as a representative of the Hawai'i Economic Development Board. He disclosed that he worked for Puna Geothermal Venture and retired in 2006. At the present time, he works as a consultant for them. He stated that there are many experts that have indicated that there will be a $200 barrel of oil increase within the next 18 months. "This is scary, whether it is true or not." Hawai'i is 90 percent reliable on fossil fuel, and it is important to seriously consider other options immediately to plan for the future.

Ted Peck introduced himself as the energy administrator for the Hawai'i State Energy Office. He was also on the panel on Friday. He stated that his heart was wounded when he heard the stories of when geothermal was first introduced, and the insensitive and inappropriate way that it was put forth. As a State and as a Nation there have been many wrong doings. However, we are now on the door step of a different kind of oppression and we have an opportunity to free ourselves from that oppression. Geothermal energy working for the community, the county, and culture can have a role with future possibilities such as transportation. Mr. Peck stated that he is honored to be a part of this taskforce and looks forward to exploring this matter further.

Co-Chair Ha stated that Hawai'i can become comparatively advantageous to the rest of the world. Geothermal will elevate our economy and community to a higher place.

HELCO Presentation – Big Island Energy Overview
Presentation provided by HELCO General Manager Jose Dizon
(See Attachment A)

PGV Presentation – Geothermal Energy in Hawai'i
Presentation provided by PGV General Manager Mike Kaleikini
(See Attachment B)

Co-Chair Ha requested that someone volunteer to collect data for the cost benefit analysis report.

Mr. Mizuno stated that the report provided to the group on Assessment of Energy Reserves and Costs of Geothermal Resources in Hawai'i was created by the State of Hawai'i Department of Business, Economic Development and Tourism (DBEDT) on September 30, 2005. He asked that the members review the executive summary identifying the five geothermal rift zones on the Big Island. All five of the combined resource areas have a minimum megawatt of 488 and a combined megawatt of approximately 1396. Since the report is dated from 2005, Mr. Mizuno commented that it is necessary to receive a current projection.

Mr. Peck advised that action will be taken to discuss that matter with DLNR.

Ms. Hoover informed the group that although the report is dated in 2005, the data was collected in 2000.

Mr. Peck's assistant interjected and stated that there is no current study.

Mr. Ho recommended that a representative from DLNR attend future meetings because they designate where geothermal occurs.

Mr. Peck volunteered to meet with DLNR and provide a report at the next meeting.

ASSIGNMENT OF COMMITTEES

- Committee on Feasibility and Cost-Benefit Analysis
  - Ted Peck and Jacqui Hoover will provide a report.

- Committee on Potential Impacts of Geothermal Energy Production Expansion
  - Nelson Ho and Patrick Kahawaiolaa will provide a report.

- Committee on Electricity Transmission System Improvements and Funding.
  - Jose Dizon will provide a report.

imbalance. This systems capability allows HELCO to control the system remotely, reestablishes the imbalance in power, and quickly restores service to customers.

GUEST SPEAKERS

Hawai'i's Geothermal Resources an Overview and History Powerpoint Presentation provided by Donald Thomas. (See Attachment "A")

Mr. Thomas explained how the island chain was formed and how all islands were derived from a planetary process called a "mantle plume." This process has been generating magma for the past 80 million years. This ultimate heat source floors Hawai'i's volcanism and it has been a long standing process. Presently, the Big Island happens to be located over the mantle plume. Kilauea volcano is over the "hotspot" and is recognized as one of the highest areas for geothermal potential. He pointed out that Kilauea actually has two rift zones the east rift zone and the southwest rift zone. The enormous size of the east rift zone compared to the southwest rift zone is clear evidence that much more lava has erupted from the east rift zone.

Mr. Thomas identified Hawai'i island's volcanoes and provided the members with a brief history on their location, age, activity, and subzone locations for potential geothermal energy.

Mr. Thomas mentioned that a Geothermal Technical Advisory Committee was formed in the past. Those members collected data in order to identify geological sites for geothermal. The committee became inactive and stopped meeting.
At this time, there is consideration to reactivate the committee so that they can gather additional information and re-evaluate the original data. In his opinion, Mr. Thomas stated that although work conducted in the 70's and 80's were sufficient, it is necessary to obtain a geophysical survey at this time.

If an update is conducted every five years, Co-Chairman Ishibashi inquired on when was the most recent.

Mr. Thomas answered that the last update was in 2005.

Ms. Andrea Gill commented that geophysical surveys were not done at that time.

Co-Chairman Ishibashi inquired on whether the committee was reactivated.

Mr. Thomas replied that an informal proposal was sent to DLNR and he anticipates meeting with them to discuss if they are interested in reactivating the committee.

Co-Chairman Ha inquired on what kind of equipment is available now that was not available in the past.

Mr. Thomas stated that there is a technique called a magneto telluric survey. It involves an instrument that looks at natural occurring electrical signals underground.

As a potential subzone for geothermal, Mr. Kahawaiolaa asked for an estimate on how long the east rift zone's heat would remain hot.

Mr. Thomas stated that it's certain that the Big Island will eventually move off of the hot spot. However, the rate of movement is extremely slow. His estimate is that Kilauea's east rift zone will remain active for at least another half a million years, and even after that, residual heat could continue.

First Nations' Futures Program Powerpoint Presentation provided by Kanoe Wilson. (See Attachment "B, C, D")

Ms. Kanoe Wilson explained that her presentation will touch upon the cultural perspectives on geothermal energy on Hawai'i Island. She briefed the members on the First Nations' Futures Program. The First Nations' Futures Program is an international alliance between Kamehameha Schools, Stanford University, and Maori from Aotearoa (New Zealand).

Ms. Wilson stated that FNFP is a leadership-development program which is involved with various community issues. This year they are tasked with investigating geothermal energy. The key note will be to look at various perspectives out in the community and to find a way to educate and promote the broader understanding of geothermal energy on Hawai'i Island.

According to Ms. Wilson, Kamehameha Schools has identified property on the west side of the island that has a potential geothermal resource.

Ms. Wilson said that her group generated a research question that would identify goals for the project. The purpose was to identify and analyze cultural, environmental, social, economical, educational, risks and rewards on developing geothermal energy in Hawai'i. Ms. Wilson mentioned that many group members did not have knowledge of geothermal energy. Therefore, rather than research everything on geothermal energy they decided they would be meet with organizations that had the expertise in this field.

Ms. Wilson briefed the members on past resistance by the native Hawaiian community. Their concerns included:

- Religious beliefs and customs
- Cultural and subsistence customs and practices; including access
- Hawaiian cultural sites
- Protection of burials and 'iwi kupuna
- Health issues from emissions
- Transmission lines through NARS and DHHL lands
- Ceded Land exchange
- Destruction of rainforest
- Impact of pollution on native birds, fauna and flora

Ms. Wilson distributed a handout on the "Legal Ramifications for Hawaiian Subsistence Practices and Rights and a timeline on Social Process in Hawai'i.
(See Attachment "C, D")

Ms. Wilson stated what the members need to be kept in mind about the native Hawaiian community is that the environment shaped them as "a people." The environment is key and critical as part of the Hawaiian foundation. It is important to understandwhere can a Hawaiian be a Hawaiian if not "Hawai'i?"

Ms. Wilson said that native Hawaiians are concerned about having to sacrifice their religion, cultural lifestyle, and identity for the benefit of others. These concerns need to be acknowledged, respected, and addressed.

Ms. Wilson recommended that the Geothermal Energy Working Group conduct listening tours. It is necessary to meet with the native Hawaiian community and receive input from them. She encourages the GEWG to meet and "talk story" with the Kupuna Advisory Group at the Hawai'i Volcanoes National Park. They have very diverse issues and they represent various backgrounds. The group consists of educators and former park employees who can offer their valuable contribution.

Ms. Wilson in addition recommended that the GEWG include a cultural impact assessment to the Legislature with their report.

Ms. Wilson mentioned that geothermal royalties are shared between the State, OHA, and the County. She suggested that there be consideration to create a special fund for educational purposes. It is important to look at future generations who will be involved in the development of geothermal energy. Ms. Wilson informed the members that the University of Hawai'i at Hilo is preparing a proposal for an engineering program. A special fund could assist our youth by offering them an internship program in engineering. It is necessary to educate the future generation that will be one day running these facilities.

Ms. Wilson informed the GEWG that her group called "Papahuilhonua" created a website in order to provide information on geothermal and to use it as a bulletin board for upcoming events. The website address is www.papahulihonua.blogspot.com. The video from the symposium is also available on the website.

Ms. Wilson entertained questions from the Geothermal Energy Working Group.

Co-Chairman Ha stated that the Mayor directed the GEWG to meet with the community. He asked Ms. Wilson if she could suggest who the members should meet with to "talk story."

Ms. Wilson will provide the members with an outline that was developed identifying key individuals within the community.

Co-Chairman Ha commented that if Geothermal Technical Advisory Committee is reactivated and zones are identified they could meet with those specific communities to discuss the environmental and cultural aspect within that zone.

Co-Chairman Ishibashi stated that it very important to address the cultural and environmental impact in order to expand geothermal. He questioned how the GEWG should proceed with community discussions.

Ms. Wilson suggested that the members meet separately with the community associations, and also with the Kupuna Advisory group.

Mr. Kahawaiolaa recommended that the group travel to each district to meet with the each association.

Ms. Wilson named other individuals associated with her fellowship group. She will provide the members with a list of those individuals.

A member from the public inquired on how the royalties were divided.

Ms. Wilson responded that the royalty percentage is as follows:

- State – 50 percent
- County – 30 percent
- OHA – 20 percent

FUTURE MEETINGS

The members agreed on the following:

- Meetings will be scheduled through an email poll. Ms. Andrea Gill will assist.
- Committee on Scheduling Community Meetings:
  Richard Ha, Pat Kahawaiolaa, Bob Lindsey, and Jay Ignacio volunteered to be on the committee.
- A preliminary report will be completed by November 30, 2010.

UPCOMING AGENDA ITEMS

- Reports by subcommittee chairs
- Timeline on interim report

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Staff Secretary

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
Hamakua Conference Room
25 Aupuni Street
Hilo, Hawai'i 96720

Minutes of Geothermal Working Group August 26, 2010

Attendees: Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Chairman Richard Ha calls the meeting to order and asks for any public statements. Kristine Kubat, a community and environmental advocate, addresses the group. She states that she intends to be a "watchdog" for the community and protect the public's interests by monitoring developments with geothermal energy operations and expansion at Puna Geothermal Venture. She also states that she suspects that there has been a lack of full-disclosure concerning past problems with PGV -- specifically, a "blowout" that occurred some years ago. She suggests that the lack of disclosure fuels suspicions in the community that the operation of the PGV electrical generation plant is dangerous to people and the environment. Finally, she admonishes the Working Group not to be an advocate for geothermal energy.

Chairman Ha advises Ms. Kubat that the Working Group is not under the sunshine law and is, therefore, not required to provide the public with access to the Working Group meetings or their findings. But, it is the Working Group's intention to keep the process open and the public is welcome to speak.

Chairman Wallace Ishibashi, Jr. thanks the speaker for her comments and asks, "How do you propose we move forward to address your concerns?" She responds that public meetings be scheduled and the community notified of the places and times. Chairman Ishibashi says that the processes the Working Group uses are still evolving, but that the speaker has valid concerns and that the community will be an important factor as the Working Group moves forward. He asks her to comment on the current conditions of the

PGV plant. She states that it has been operating for decades and appears to be safe -- that she knows of no emergencies or failures that threatened the public or the environment -- but, that there are still "a lot of suspicions" because the public doesn't know everything. She advises that there should be transparency in the process. She said that no overtly pro-geothermal information should come out of the Working Group's report. She said a community apology is needed; she proposed using the Pahoa Community Center. Also, there are rumors of the dumping of chemical toxins at PGV.

Chairman Ha asks if any other member of the public wishes to be heard. There is no response. Chairman Ha introduces Mitch Ewan who will give a presentation to the Working Group today.

James "Mitch" Ewan - ewan@hawaii.edu - Hydrogen Systems Program Manager - Hawaii Natural Energy Institute - University of Hawaii
1680 East-West Road, POST 109, Honolulu, HI 96821.
Technologist and applications specialist. Mitch had been in the hydrogen business for twenty-five years.
OFC: 808-956-2337
CELL: 832-212-6129
FAX: 808-956-2336
Presentation: Hawaii is the most petroleum-dependent state in the union. The County of Hawaii spends $1 billion per year on petroleum. By 2015 the projected cost of a barrel of oil will be over $200. Both transportation costs and business costs will be affected. However, Hawaii has sufficient renewable resources that can be developed to supply all of Hawaii's future energy needs. Big Island has 150% of resources compared to projected needs. Geothermal is the most effective, efficient, and fairly inexpensive to produce. Photo-voltaic is the most expensive to develop; wind is the least expensive. If energy is used to produce hydrogen, the outlook is especially promising.

The Clean-Energy Initiative mandates that 70% of Hawaii's energy be clean and renewable by 2030. Hawaii exports a lot of money for energy. Energy that Hawaii locally produces will keep money in the state and translate into more local jobs. Funding is available from various government agencies. For example, a public bus system for the Puna district is being developed that will use hydrogen fuel supplied by the PGV plant. US DOE is funding the buses.

Hydrogen can be produced from geothermal, wind, and biomass. 60% of municipal waste that is already collected (and whose biomass energy potential is lost when dumped) can be converted to fuel.

The GM Equinox runs on hydrogen - GM will introduce 100,000 vehicles to Hawaii as a testing site; the marine base on Oahu will be using this vehicle. Hydrogen can be used to store energy. Richard Ha asked what are the chances of bringing these cars to Big Island and Mitch Ewan said that there is a very good chance -- especially if refueling sites were in place. GM already has an office in Honolulu. Volcanoes Park diesel buses will be replaced with fuel cell buses.

The state has a $10 million fund for entrepreneurs who develop clean energy. There is a hydrogen fund. The Hawaii Center for Advanced Transportation Technologies (HCATT) was first established in 1993 as the Hawaii Electric Vehicle Demonstration Project to represent the Hawaii Consortium in the Defense Advanced Research Projects Agency's Electric and Hybrid Vehicle Technology Program. In 1999, it transitioned to the Department of Transportation's Advanced Vehicle Technology Program, and in 2001 it formed a partnership with the Air Force Advanced Power Technology Office and established the National Demonstration Center for Alternative Fuel Vehicles at Hickam Air Force Base in Honolulu. HCATT will be doing the Volcanoes Park bus-engine conversion and works with the USAF. Clear Fuels is a fuel company that develops hydrogen fuel through conversion of biomass.

Mitch Ewan is an advocate of the community-sized conversion plants, rather than large-sized mega-conversion fuel plants. Fuel facilities already exist on Oahu with plans for new construction. Big Island has a small wind-turbine automated plant to produce hydrogen that can be controlled over the Internet on the Kahua Ranch. Took a year to develop but works well.

HNEI will provide hydrogen to Volcanoes National Park for the fuel-cell buses. HNEI uses an electrolyzer. Park Services is working to get the approvals. $1.2 million funding from DOE. $1.2 million from State of Hawaii. 2 million visitors to the park will learn of the project. Target date: January 12. Hydrogen station is built and will soon be shipped to Hawaii. The movie theater and visitors center will be powered by hydrogen. Big Island can be ringed by hydrogen fueling stations and shuttle buses can provide a feeder service from people's homes in Puna to hydrogen-powered buses that will operate throughout the county.

Hydrogen will be used also as an energy storage system -- to take the extra PGV electricity for hydrogen conversion to be stored. Fertilizer is a by-product of the conversion and reduces agricultural costs. Fish farms can use the oxygen from electrolysis.

The Hawaii grid is at maximum for metered renewable energy since a petroleum generator must be in standby mode due to vagaries of wind and sun. A large electrolyzer can meet the power fluctuations in the grid while it is producing hydrogen and oxygen. Ammonia is a safe way to store the hydrogen and transport throughout the islands.

Question from audience: How large a roadblock is permit processing from the government?
Answer: If the power is produced for sale, rather than exclusively for the grid, permits would not be required.

The electrolyzer produces hydrogen and oxygen; nitrogen from the air can be combined to produce ammonia (NH3). 12,000 kWh can be produced for each ton NH3. 30

kilograms of hydrogen is equivalent to 30 gallons of gasoline. GM cars have a range of 150 miles on one tank of fuel.

Tube trailers (gas cylinders on trailers with safety features) dispense fuel and can be used as mobile stations. After proof of the concept is accepted the smaller electrolyzers will be replaced by larger as the operation becomes financially viable.

Question from Working Group: How much does it cost to run the fuel-cell bus system; is it sustainable or is funding required?
Answer from Mitch: Initially, subsidy funding will keep the project viable; an analysis of the trial-phase of the demonstration project will illuminate the hidden expenses. The geothermal-plant electricity will keep the greatest expense -- process electricity -- at a minimum. That fact attracted the DOE's interest in funding the demo project.

Question from Working Group: What is the cost for the electricity for the system already in operation?
Answer from Mitch: It is about 23 or 25 cents per kilowatt-hour on Oahu; we haven't negotiated a price with PGV, but we expect it to be about 5 to 7 cents per kilowatt-hour.

The reason the national park is being used is because there are vehicles there that the park service wanted converted, not because it is federal money funding the project. The reason the GM cars are on the military base on Oahu is because the the vehicles are prototypes and very expensive. The portable fueling stations are intended to be towed by hydrogen-powered trucks. The technology to store and transport the hydrogen fuel exists and is used everyday in many places on the mainland. The low-pressure systems are safe and inexpensive. Similar systems can transport fertilizer to farms and fuel to transfer stations.

Mitch showed slides of the GM hydrogen vehicles. Initially, the US Army is getting five, the US Navy is getting five and the US Air Force is getting five. Eventually, thousands of the vehicles will appear on the islands as GM rolls out the models for testing in Hawaii.

Several government and non-government entities can contribute tax money and grant money to the projects and need to be approached as soon as possible with requests for funding. When it transitions to a profitable commercial operation then local businesses will have an interest in backing the projects.

Question from the audience: What's the conversion cost between hydrogen and gasoline? Would car-rental companies be interested in using the fuel-cell cars in their rental fleets?
Answer from Mitch: It takes 60 kilowatt-hours to produce a kilogram of hydrogen - so, depending upon the cost of electricity, it can be competitive with gasoline, especially with a fuel-cell vehicle as opposed to a hydrogen gas vehicle. As the price of petroleum rises, the hydrogen fuel becomes more competitive and businesses can be certain what their fuel costs will be, rather than being at the mercy of foreign markets.

Question from the Working Group: How long before there are commercial quantities of hydrogen being produced?
Answer from Mitch: I'd give it the five-year window depending upon funding. A commercial electrolyzer can kick out a lot of hydrogen, but they are expensive - on the order of $2 million. In one year the parks buses will be working. Until the general public buys hydrogen cars or converts their cars, the fueling stations will be available, but under used.

Question from the Working Group: Can you explain how the hydrogen fuel-cell works.
Answer from Mitch: It is similar to a battery design; there are two gases, hydrogen and air, separated by thin plates that allow interaction with one another aided by a catalyst. In the process of combining together they create electricity. The electricity is used to power an electric motor.

Question from the Working Group: Do you anticipate that the fuel-cell car will replace the battery car?
Answer from Mitch: No, both technologies will coexist and improve over time. The fuel-cell works like a hybrid.

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After the presentation, the Working Group discusses the minutes from previous meetings, makes required changes, and formally approves the minutes. Richard Ha introduces administrative volunteer, Christopher Mann. Working Group discusses Sen. Kokubun's recommendations concerning what form the Legislative Interim Report should take. Chairman invites volunteer to discuss mechanics of compiling data and shaping the report through email and email attachments. The volunteer will act as editor and return the material to the Working Group so that all members can see the text of others and the progress of the overall document.

Nelson Ho suggests the Working Group determine the specific and substantive issues for the foundation of the report. Jay Ignacio asks the administrative volunteer to clarify how he will be assisting the Working Group.

Wallace Ishibashi recommends that all the sub-committees submit their text to the administrative volunteer who will put the material into an agreed-upon format and then distribute that to all the members of the Working Group.

Nelson Ho suggests that to start, an objective set of bullet points would give direction to the writers, who would then offer their own expectations and bring their own expertise to the project. Nelson Ho suggests the report include energy resources that credibly compete with geothermal.

Jay Ignacio states that the Working Group needs to know what specific writing assignments each member has.

Wallace Ishibashi recommends that the administrative volunteer create a list of writing assignments and provide that list to Richard Ha.

The administrative volunteer offers Richard Ha a list that is a synthesis of statements from SCR 99 that can be used as bullet points to make writing assignments. The Working Group agrees to continue the meeting and make the writing assignments from this list and some additional considerations.

Patrick Kahawaiola'a states that although public perception may be mixed learning that Jay Ignacio sits on the Working Group - as if HELCO might have undue influence -- nevertheless, the group needs his expertise to make the best recommendations to the legislature. Patrick Kahawaiola'a inquires that, since it is HELCO's position that further expansion of the electrical grid will not include petroleum-based generators, will geothermal be the number one alternative or will other types of electrical energy generators will be used?

Jay Ignacio states that given the practical considerations of increasing demand, design dependability, and past history, at this time it would be unwise to depend entirely upon geothermal plants for the island's energy needs. A statistical analysis of probabilities will likely tend toward a mix of alternatives and fossil-fuel generators. The utility and prudence of keeping fossil-fuel energy available to the grid represent the most reasonable approach.

Barry Mizuno opines that demand for energy of all sorts, transportation as well as electrical house power, will doubtless increase. Accepting that fact, Hawaii is best served by developing resources that are available locally rather than depending on resources that the island doesn't have.

Nelson Ho and Patrick Kahawaiola'a agree that it would be helpful if Jay Ignacio could provide specific energy-demand projections and potential resources to meet those needs so that they could approach communities that would be affected by construction of power plants, present the facts and ascertain public reaction.

Richard Ha states that there have been changes to conservation land rules and changes to sub zone protections that the Working Group needs to be aware of.

Patrick Kahawaiola'a states that if all the geothermal plants are scheduled for construction on protected lands, everyone might as well go home.

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Minutes of Geothermal Working Group October 11, 2010

Present: Andrea T. Gill, Ted Peck, David Matise for Carlito P. Caliboso, Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Guest Speakers:
Patricia Brandt, IDG CEO/Board of Directors
Mililani Trask, Indigenous Consultants
Roberta Cabral, IDG Senior Advisor
Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

John Olsen, a member of the Puna community: John Olsen is not representing the Sierra Club at this meeting. He states that for 20 years he has experienced trouble. People are making a political decision rather than scientific or economic-based decision. He is very familiar with the development of geothermal energy. Mr Olsen expresses concerns that decisions based not on costs or accurate projections. Cost / Benefit - information has not been shared. Quotes the MIT Chair of Energy and offers a handout of the professor's opinion that Solar Energy is the best choice.

Steve Dearing, project manager for Kealoha Energy - filling in for the designated speaker, Ms. Kuulei Springer, who could not attend today - developing a 25 to 30 MW facility to replace the oil-burning plant in Hilo. The late James Kealoha was founder of the company. Cost is $3 million per MW. Proposes a $90 million plant for Puna. Time to become self-sufficient and

cease the oil-based energy power system. He advocates geothermal as part of non-fossil grid generation. 89 acres already designated for geothermal and ready to drill test wells. Rates on Hawaii are higher than on mainland. Proposes Kealoha Energy will cut electrical rates and create jobs. Local residents can be hired to work for Kealoha Energy. Many companies are ready to do the construction. Property will be leased to operator for percentage of profits. Asks for Working Group's support to have Kealoha Energy provide clean and reliable energy. Co-Chair Richard Ha invited the company to make a formal presentation to the Working Group. Mr. Dearing states that paying 35 cents per kilowatt hour "is obscene." Geothermal Developments is a small company, but will partner with larger groups to get the job done: possible growth to 70 MW. Contact and information at: kealohatrust.com.

Member Nelson Ho. stated it was the first time he was aware of another geothermal proposal in Lower Puna and concurred with Chair Ha in requesting that Kealoha Trust and Ms. Springer be formally invited to make a presentation.

Mr. Dearing states that he has not been able to get through to the Working Group. He is not a fan of the Sierra Club. He was offended that his presentation was not warmly accepted. ORMAT has held up the Kealoha development for 17 years.

Moani Akaka: Was in a photograph when the geothermal well had a caustic blowout in early days. Has reservations about geothermal. However, if it is to be done, it must be done properly to avoid the problems of the past. Local community was adversely affected by failings of the first plant. Says geothermal should be owned by local population and benefits provided to local population. The geothermal price should not be the same as oil-based electricity. Hawaii should not be industrialized like Pittsburg; ORMAT is obsolete - 3 decades without benefit. Working group must prove that geothermal is safe. Insulted that anyone would demean the Sierra Club, who protect the aina.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: hopes for success of the working group, however, the group seems to advocate PGV to the exclusion of alternatives, like an addict to replace fossil fuel with geothermal injected into the same system. Other ways could be available, direct-use applications, jars sterilized for food sold at farmers markets, for example. Small-scale technologies are a potential. If oil runs out, H2 generation from excess PGV production is a good idea, but for community, not just tourists. Mitch Ewan's idea to develop hydrogen buses was initially for tourists - not the plan has grown to include community transportation. Compressed air may be superior to hydrogen. Danger is alliances that are formed between existing groups to protect the status quo - others need to be represented and future generations must benefit, also. Think ahead and progress is possible.

Co-chair, Wally Ishibashi states: this is not a PGV committee and that the Working Group is willing to listen to all voices and alternatives.

Member, Ted Peck states that Mitch Ewan is under contract with the Energy Administrator to fulfill the Hydrogen Fund.

Member, Patrick Kahawaiola'a advocates going to communities to receive the public's energy concerns - anyone willing to schedule a meeting, please do so. The host culture should benefit from developments and improvements in the state.

Moani Akaka: Office of Hawaii Affairs receives revenues from ORMAT - the Puna community should benefit more and that benefit should be visible.

Co-chair, Richard Ha: attended Peak Oil Conference in Washington, DC. Reads from website. Platts News Service is a leader in providing energy-related news regarding energy price assessment. A panel of geologists and energy analysts debated Thursday the severity and timing of an anticipated oil crisis, with one saying during a Washington briefing that crude oil production has now peaked.

"The global rate of production of oil is peaking now,"said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin. "The size of accumulation [of oil] is not equated to the rate of production," he said. Frank Rusco, an energy director at the US Government Accountability Office, estimated some 45 years of "proven reserves," though current and future oil demand will stress supplies.

"Higher oil prices can retard economic growth and even cause a recession in the right circumstance," Rusco said at the briefing, which was organized by the Association for the Study of Peak Oil and Gas. He declined to say after the briefing what a gasoline price ceiling might be for US consumers. "The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," Rusco said, citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper." Meanwhile, "mitigation of oil dependency by transitioning into other energy sources will take upward of a decade to come into play. "Sometime after a decade, mitigation will take impact and things will start to flatten out," Hirsch said.

New reserves from Brazil and production from unconventional sources in the US will not be enough to compensate for depleting reserves, panelists said. The Ghawar oil field in Saudi Arabia, still a bright light in the petroleum world, could see a sharp and imminent decline in production, Patzek said. If Ghawar "peters out, to replace it [with production elsewhere] will be a very difficult task," he added. He estimated Ghawar's current production at between 4.5 million and 5 million barrels per day, though added that actual production figures are unknown as they are a "top secret."

Later, on the sidelines, Patzek said Ghawar could become the region's Cantarell, referring to Mexico's offshore oil field that has seen production plummet by over half from a peak 2.1 million barrels per day in the mid-2000s. Patzek said that the ongoing water-flood efforts into the Ghawar field to stimulate production will eventually taper off. "You're injecting twice as much water into the well," he said. "Your field is watering out," Patzek said in an interview

Patzek told the briefing that Norway's reserves have peaked, while he characterized the decline rate in the US Gulf of Mexico as "very high." BP's Thunder Horse well in the Gulf "has not reached its potential and it's declining faster than people thought," Patzek said. A BP spokesman was not immediately available for comment on Patzek's remarks about Thunder Horse.

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference. "This is not a recovery that we're in," said Nicole Foss, a former fellow at the Oxford Institute for Energy Studies, who predicted "chaos" in foreign currency and equity markets within years. A severe deflationary plunge will contribute to a liquidity crisis among the financial sector, Foss said on a peak oil panel late last week. The meeting in Washington wrapped up Saturday.

"Oil will bottom early in this depression," Foss said. She and fellow panelist, energy analyst, Chris Martenson, predicted that foreign currency markets will become more volatile, with domino effects on global money supply. "It's not unthinkable the the US will have another financial crisis," Martenson said, adding that he gave the US a "50%" shot at having a fiscal crisis and a "50%" chance of experiencing a currency crisis. "We're going to see severe dislocations in the foreign exchange markets."

Deflation is tomorrow's problem," Foss said, adding that a lack of purchasing power will undermine price support for crude oil. Then "printing [money] is a few years off," she said. "We could see $20 per barrel and then $500 per barrel within the space of five years," Foss said. Foss runs the Agri-Energy Producers' Association of Ontario, where she has focused on farm-based bio-gas projects and grid connections for renewable energy. At Oxford, she researched electricity policy at the EU level, according to her website. She was previously editor of the Oil Drum Canada, where she wrote about peak oil and finance.

Speaking on the sidelines of the conference, Foss said that natural gas holds no promise as a safe hydrocarbon haven in a scenario of volatile crude oil prices. There is a "perception of a glut" of natural gas reserves and other resources from new shale plays and coal-bed methane and tight formation gas Foss said. "I would argue that this is an illusion," Foss said. The environmental cost of extracting unconventional resources "is tremendous," Foss said, adding that the energy resource "bang for buck" is unappealing. "We'll end up with natural gas price spikes, "after years of low natural gas prices," she said.

As demand out paces supply, the urgency to do something to anticipate the crisis becomes greater. Hope replaces shock if we agree that we can figure out ways to help fend off the panic 2 to 5 years away from oil spike - lowest economic group will suffer the most when prices rise. An analysis of $200 per barrel oil, even without great detail, it would be devastating to the Hawaiian economy.

To compare: 35 acres of geothermal equates to 35,000 acres for bio-mass -- 7 cents per pound if farmer were to grow bio-mass without subsidies -- it would never happen.

Member Nelson Ho suggests to discuss these matters later on in the agenda to permit presentations would be more appropriate.

Presentation by Innovations Development Group - Patricia Brandt, CEO/Board of Directors, Mililani Trask, Indigenous Community Advisor, Roberta Cabral, Senior Advisor. Office email: info@idghawaii.com.
Michele, Staff Assistant. Ryan Matsumoto.

IDG has 10 years experience with geothermal and represented the Maori of New Zealand in three energy-development projects. The overarching approach is to respect human rights while developing energy resources: Native-to-Native process. IDG is an Hawaii-based strategic planning company that is focused on renewable energy development. IDG wants Hawaiians to control their own resources. In New Zealand, the Maori Queen and IDG developed plans to coordinate contacts with the experts to develop locally-owned resources. Equal representation is the key to a successful geothermal drilling. Improvements in technology are required to avoid toxic venting of gases, adverse impacts to the environment, and to provide for the general benefit of the community. IDG provide expertise choosing the best project, the right developer, and training for local people.

Mililani Trask presented an outline of the Native-to-Native model -- recognize human rights of homeland to benefit from development. Must address climate change and renewable resources. Old model of resource exploitation is outmoded. UN declaration for human rights is the foundation to the development model - preserve cultural heritage - environmental sustainability - socially responsible. Hawaii most at risk for shortage of fuel due to dependency on energy - Hawaii County is the largest landmass in US capable of being energy self-sufficient. Development of firm-power geothermal needs tax incentives - policy needed that recognizes geothermal is primary resource of ceded land trust. Carbon footprint shared by all who drive and use energy. Geothermal development requires a community collaborative model - equitable sharing of resources. How do Hawaii Renewable Energy Development Venture describe stakeholders? It shows who you are dealing with. Mostly corporate members are stakeholder. No local representation. Need cultural affiliations - equitable and fair - need to comply with legislation. Ignoring cultural considerations led to court proceedings. Also, it was cheap and filthy technology that led to geothermal blowouts 20 years ago. Need appropriate technologies for Hawaii's conditions. Environmental issues need to be addressed at the planning stage. Hawaii paying the highest rates for electricity in the country due to lack of participation in negotiations at early stages.

Pele Defense Case set standards - deviated bore (drilling at an angle) provides access to resources that lie beneath environmentally-sensitive areas. Community involvement needs to move first.

Three Economic Models: 1) ORMAT type is Build-Own-Operate and transfer of benefits years later 2) Royalties are pennies on the dollar - not equity benefits - fixed fees per MW 3) Equity owners at all levels are invited to sit at the table. Participation means shared income.

Roberta Cabral - The general public and native interests are vested in indigenous mineral and geothermal is a mineral. Initial investment in research is critical for later negotiations with investors and developers. The negotiation model leverages community, investors, and developers interests. Need to partner with bonafide geothermal developers. IDG proactively seeks support of local population with Community Collaborative Model. IDG specializes in community connections as well as understanding that geothermal shall not be the exclusive resource - but, an important resource. Risk is capable of being measured - that relates to the cost of capital - Collaborative Model structures a PPA (Power Purchase Agreement) with percentage of surplus cash dedicated to the developer and share a percentage of the proceeds in a community trust. IDG provides protection for developers by paving the way for community partnership. The community receives benefit from the trust.

Member, Ted Peck states that there is some question as to whether or not the PUC would approve this type of trust with money going into it. The legislature must set policy for this type of model - community equity - change in model now - cannot undo what contract-in-place stipulates under Hawaii's constitution.

Roberta Cabral - money from project to community can be used for stewardship; trust fund goes to community's benefit: parks, businesses, educational scholarships, farming, fish tanks, fish drying, spas, etc. Technical and financial partners chosen by IDG, who assume risk. IDG strategy is to bridge the gap between community and developers. IDG thinks geothermal is the way to go.
IDG wants to be selected as a preferred geothermal developer. IDG has the experience and the expertise to do the deals.

John Olsen, a member of the Puna community, states that actually it is the community that takes all the risks - money is just paper. The evacuations of Puna residents due to venting demonstrated that fact.

Member, Nelson Ho requests a copy of the IDG presentation to be reviewed in detail by the committee.

Co-chair, Richard Ha, suggests IDG create a proposal for legislators.

Member, Jay Ignacio states - need to balance disclosure to legislation and proprietary information of IDG's. Since SCR99 directs the Working Group to report on establishing a community-benefits package, IDG's model may fulfill that requirement.

Member, Ted Peck states that the community-equity model needs to be articulated and some statutory language may be the starting point.

Presentation by Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii - guy@EnergyFutureHawaii.org
Speaking about the NH3 Energy Conference in Detroit.
NH3 is ammonia and the point of the conference is to demonstrate that ammonia is a good way to carry energy. Geothermal is a good way to create ammonia. Expansion of geothermal

must occur first - before secondary industries can be established. Farmers need fertilizer to get nitrogen into the soil. Ground transportation is the single largest use of fossil-fuel energy, so load varies with tourism in Hawaii. Geothermal can be used for ground transportation, as well.

Off-peak hours, curtailment which could mean waste (with fossil burning) or production if used to convert water to H2. Electrolyzers are used. H2 can be used to fuel transportation, but H2 vehicles don't represent a very large part of the transportation system. So, at 2008 Conference, the speaker, Richard Ha, asked Guy about converting H2 to ammonia. HNEI slide - ammonia is the practical man's hydrogen. Synthetic Urea (a dry form of ammonia fertilizer) accounts for 3.6 tons of NH3 per day on island farms. If geothermal were expanded to 720 MW it would create enough gasoline-equivalent can provide fuel for all autos on Big Island. The Dept of Energy with matching state funds have a pilot project to build and maintain 2 hydrogen fuel buses.

Member, Ted Peck states meeting with Mayor today and discuss feasibility of transforming all county buses to H2 and what is timeline.

General Motors and fuel companies are introducing Project Driveway - vehicles that use H2 and an infrastructure to support it.

Ammonia is a good way to move energy. Ammonia to Oahu for power instead of the expensive power line. Ammonia is denser with hydrogen than liquid hydrogen. Ammonia could be an exportable commodity. The energy conference demonstrated many different research designs that used ammonia as the fuel source. Renewable Hydrogen Network - Japanese graphic of renewable ammonia combined with H2 and O2 for best fuel. Injection of water into ammonia improves fuel characteristics.

Member, Ted Peck asks about the capital investment for ammonia plant - Guy Toyama will provide the report. Mr. Peck needs to leave for another meeting.

-- Ten-minute recess --

Co-chair, Richard Ha: Call back to order

Working Group Members discuss the Geothermal Interim Report for Hawaiian Legislation - Format and content

Member, Nelson Ho states some concerns: that the working group is not ready to answer / address all aspects of the information required for the legislation 1) revenue sharing - especially for the least represented 2) impacts to PGV neighbors: air quality / noise 3) DNLR's role in process 4) regulatory agencies' input 5) all forms of energy have subsidies - stated or not - need scientific information regarding expansion of PGV's present capability.

Co-chair, Richard Ha: Need to discover from Working Group Member, Bob Lindsey - where does the money go - what benefits?

Co-chair, Richard Ha asks Working Group Member (HELCO), Jay Ignacio, what needs to happen to take the next step?

Member Jay Ignacio says a Resource Plan will address what mix of resources will be used going forward. Clean Energy Scenario Planning (undefined at present) - Identify the resources, location dependent, stability is essential. HELCO will produce a study, but not the official public utility plan, outlining the integration of resources. The essential requirement is to move from high-level discussion to defining the specific resources and their particular locations and capabilities. Geothermal is an option, but without certainty of investment, developers won't begin building and without existing facilities, HELCO cannot plan assuredly to integrate into the grid.

Member, Andrea Gill: Needed are detailed resource assessments defining the scope of available energy and how it can be developed. There can be no absolute certainty about a resource. Only drilling and actual steam production will verify - so need to find the level of comfort in planning using exploration data to project future growth and integration of new power plants. Also, Kealoha Energy's plan is more preliminary than has been asserted.

Member, Jay Ignacio says that working with researchers to identify high-probability resource locations is a first step, the determine how development will be funded.

Member, Nelson Ho: Regarding baseload growth of power production, what is the recommendation according to HELCO's last completed plan? What estimate did HELCO make in terms of baseload growth in MWs? What's the preferred type of plant?

Member, Jay Ignacio: Theoretically, all fossil-fuel power plants could be replaced. If the resource is viable and a benefit to HELCO's customers, the PUC would approve a change to geothermal plants. Last filing of projections predicted a 2010 need above 200MWs peak. Presently, peak is about 185MW. That means the plan for bringing on a firm, large-capacity generator in 2020 can be pushed further, since demand has not reached projected growth. On-site generation and the economic downturn altered the growth in demand. In 2022 or 2023 there is a plan to bring on another geothermal plant, but not sure how it will come about. The preferred type of plant meets the needs of the customer: reliable, low cost, and no adverse impact on the environment.

Member, Andrea Gill: Can HELCO's contract with Hamakua Energy be displaced with expanded geothermal?

Member, Jay Ignacio says HELCO has a thirty-year contract with Hamakua Energy that goes out to 2030. They are compensated in two ways: 1) for being available - capacity and 2) for the energy HELCO uses.

Member, Patrick Kahawaiola'a asks if geothermal at PGV is producing at capacity and if HELCO is buying all power produced. What resources can provide electrical system stability in addition to fossil-fuel plants?

Member, Jay Ignacio says HELCO curtails purchase of power from PGV at night. Shows a graph of the electrical load profile. As demand decreases, certain plants can be curtailed. Oil-fueled steam plants cannot be taken off-line without rendering the system unstable. New designs of geothermal will have the reliability required to ensure stability to the grid, but the current design at PGV does not and, hence, cannot dependably and safely displace the oil-fueled plants. But, in parallel with exploring alternative energy resources, HELCO is exploring alternative fuels. Bio-mass may not be the answer, due to economic constraints, but alternative fuel sources are an option.

Kristine Kubat asks Jay Ignacio if HELCO sees itself as a developer of alternate energy and alternate energy resources?

Member, Jay Ignacio states that HELCO is flexible in the matter of bringing new resources to the system. The utility has the burden of providing service. An independent provider does not have an equivalent responsibility. If HELCO retires its plants and is no longer financially viable, it cannot provide the service as mandated by the public.

Member, Nelson Ho says it is the nature of geothermal that it cannot be throttled back to match demand, the steam is thrown back into the earth and wasted.

Member, Jay Ignacio says that using geothermal energy independent of the electrical power grid would permit more geothermal to be developed effectively and, for example, electrical transportation would provide that use. Nevertheless, geothermal's short-comings have to do with the technical/engineering side and the geophysical limitations of the resource.

Member, Nelson Ho says that the geophysical limitations are what John Olsen and Sierra Club have been pointing to all along. The resource is about pinpointing discrete water and rock formations that have desirable characteristics and that operation is problematic has a great deal of risk and uncertainty associated with it.

Member, Jay Ignacio says that the trouble is often the extraction; wells get clogged and can no longer produce, so other wells have to be drilled to replace them.

Co-chair Richard Ha asks if it is about the return on investment - if enough wells are profitable and productive, the systems works well. It is about managing the resource.

Member, Nelson Ho says that if the relevant problems are defined in the Interim Report, the group will be on its way to providing information to help solve the problems.

Member, Jay Ignacio says the problems with accepting photo-voltaic energy and the contracts that exist with wind could mean that later contracts are turned away before older commitments. So, even if geothermal proved to be less expensive, HELCO might be prevented from buying it.

Member, Patrick Kahawaiola'a says people outside of the working group don't understand that part -- and need to be told. If geothermal will be available at 6 cents per kilowatt, but HELCO has to pay 35 cents for wind because of an oil price spike, people will be confused and angry.

Co-chair Richard Ha says that the inter-island power connection starts to make practical sense - especially, as resources costs rise.

Member, Andrea Gill asks, is HELCO paying 15 cents avoided-costs for wind regardless if it is firm or intermittent?

Member, Jay Ignacio says, Yes. Contract exists for a long time. If we don't take aggressive steps to expand geothermal, especially if oil prices go to $200 per barrel, there will be problems supplying energy to meet demand. It will take time to prove reliability and come to be a dependable part of the system. It is at least a year to bring a plant online. How well that source will be managed is fundamental to the level of confidence. Plants cannot be retired until there is demonstrated reliability and a redundancy in case of problems. Propose that HELCO runs two simulations to provide data on how transmission expansion scenarios would play out.

Member, Andrea Gill says new resource data is needed to remove uncertainty regarding growth and stability. Landowners can request to be in a subzone or removed from a subzone if it appears a resource is there. Need to work through the DNLR. The DNLR can create a committee as it did before. Currently outlining the issues for the Interim Report.

Next meeting have a draft of report to look at. Propose November 8, 2010 as date for next meeting.

William P. Kenoi
Mayor

Walter K.M. Lau
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Geothermal Energy Working Group
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Minutes of Geothermal Working Group November 8, 2010

Present: Robert Lindsey, Ted Peck, Carlito Caliboso, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: states that she has read the Working Group Interim Report draft and objects to the optimistic language regarding geothermal. Petroleum analysis is plentiful, but there is limited analysis for geothermal. Despite the fact that Big Island is located above a geothermal hotspot, the resource available for geothermal may be depleted. In her estimation, geothermal is not a renewable resource. She says that the report should so state. She objected to the statement: a resident could have their property removed as a subzone designated for geothermal if the resident so desired. The petition is difficult for people to do. Also, she asks for facts about HELCO plans to retire oil-fired generators. Also, she asks PGV to come forward with facts. How much does it cost to build a geothermal plant. The concept of firm-power for baseload needs to change. Depletion, firm-power, geothermal resource subzones all need to be defined clearly. She wants to make some recommendations in the final report.

Jon Olsen, a member of the community, says he and 87 others withdrew their properties from the designated geothermal subzones. The state did not respond favorably to their certified letter. He has copies of legal filings and he will provide when necessary. He expresses his concern that the current evacuation zone around PGV hasn't been discussed.

The EPA requested that the state and county create a notification program and that has not occurred. There is a concern about heavy metals and sulfur being released into the environment around PGV. He believes every chemical is within seawater, many are dangerous, and the geothermal plant wells may release them.

Steve Phillips, a member of the Puna community, had a bad experience with geothermal before. He said that the law should be changed to permit a contested case hearing. Any new development that impacts the community must uphold the rights of those in the neighborhood. He stated that geothermal gases poisoned his son in his crib. He stated that he lost his marriage because of geothermal. His property values went down because of geothermal. He said he wrote rules for a geothermal asset fund that were never used. How will the mess of a decommissioned plant be funded when it needs to be dismantled? That is what the asset fund is for. He will do everything in his power to halt geothermal development unless the community has a contested case hearing. The community led to improvements over the poorly designed and built experimental well.

Robert Petricci lived in the neighborhood during the development of geothermal and was evacuated years ago when there was an open venting. He also wants a contested case hearing. There will be problems if geothermal is built where people live. Also, geothermal developers must not cut corners during construction.

Member Robert Lindsey says he thinks a contested case hearing is a good idea and fits in with SCR 99. To move forward with geothermal means that we must contend with some of the past errors.

Co-chair Wally Ishibashi says everyone knows some things were done wrong in the beginning, but we are moving in the right direction now. Everyone wants things to be done correctly. We are trying to do the best we can.

Member Nelson Ho says the legislature took away the contested case hearing and that the Working Group can make a recommendation.

Member Carlito Caliboso says that the Interim Report should focus on the issues directly related to SCR 99.

Member Ted Peck says since it is the Interim Report, we don't need all the answers.

Co-chair Ha asks if anyone has suggestions on how the report should go.

Member Carlito Caliboso reiterates that the report should only address the points expressed in SCR 99.

Member Ted Peck says the report can tell the legislators: here are the answers to these problems and here are the issues we need to track down. Also, the Executive Summary needs to be really tight.

Co-chair Ha invites the volunteer editor to the working group table to receive point-by-point instructions and edits of the report draft from the working group members. Appendices can

be used for bulk information and details referenced in text. Also, PDF files permit members to make comments on the text. A discussion of the executive summary ensues regarding key points and the possibilities of disagreements and unresolved issues. The members resolve to work on the Interim Report via email. There is a need to assess resources specifically. Need discussion of geothermal electricity potential, but also secondary industries, such as hydrogen and ammonia production. The scope of the resolution forms the basis of the contents of the report and the over-arching analysis of baseload feasibility. However, there is a need for context regarding peak oil and other considerations that provide the basis for the working group's recommendations to the legislators.

Member Nelson Ho states that the report should be lean and cut-to-the-chase rather than offer too much information. The information needs to be clearly stated. Since the environmental impact is site specific, there can be no information on the impact without identifying the location of the resource or how it will be developed.

Member Barry Mizuno agrees that the most critical issue should be to identify the resources available. More testing is needed.

Member Ted Peck points out the shortcomings of available data on geothermal. Report needs to discuss issues as well as upside.

Members Ted Peck and Nelson Ho discuss the pros and cons of mediation versus contested case hearing with the community members.

Co-chair Richard Ha discloses his discussions with a development group who are investigating the possibility of developing geothermal on Big Island. He has not joined with them and will keep the working group aware of his role, if any.

Members Nelson Ho and Barry Mizuno discuss the role of geothermal in the future and the need for geophysical data.

General discussion of format and structure of next draft using printout of existing draft among Working Group members and volunteer editor. The consensus is to build the report so that it is concise and focused on the SCR 99 mandates. Circulate the next draft in three sections: Executive Summary, Working Group writing assignments, and Appendices. Start with addressing using geothermal as primary energy resource as the Working Group conclusion and the additional uses (transportation and ammonia production) as secondary benefits.

Member Carlito Caliboso states that there may be a conflict if he supports geothermal uses before the legislation and is later asked to decide on geothermal development with the PUC.

Member Ted Peck states that even if members must recuse themselves from advocating for specific development, it is appropriate for the Working Group to assert its principal findings: that multiple geothermal plants are the most prudent approach, that historically geothermal is a lower-cost energy resource, it has the potential to supply baseload electricity, although it has not yet demonstrated baseload consistency in its application in Hawaii. It is a renewable resource indigenous to Big Island and can neutralize the price volatility of petroleum fuel for the county both in terms of the electrical grid and in terms of transportation. Additionally,

products that assist in island agriculture can be cost-effectively produced with geothermal and replace the importation of products made on the mainland from fossil fuels. Thus, it has a significant potential to be Big Island's primary energy resource.

Member Jay Ignacio advises that reliability is essential to satisfy the utility's need for dispatchable energy on demand.

Member Barry Mizuno suggests that if other geothermal plants were in operation and each one of three produced the mega wattage for the grid as well as electricity to create other products and services, than the combination of generation beyond the grid's requirements would permit reliability so that, if needed, one or more could serve in another's place.

Member Ted Peck states that a robust environmental impact statement can mitigate community concerns. A general discussion concludes that the contested case hearing be explored, but not recommended to the legislation at this time.

Member Jay Ignacio cannot speak to the intricacies of specific expansion of the HELCO grid, since that requires detailed study. However, he proposes a HELCO-funded, high-level study to look at a hypothetical expansion in two locations.

Member Ted Peck states that funding would be necessary to fully analyze the impact of a transition to geothermal. For example, shippers and dock workers may loose work importing supplies for petroleum-based plants. It is generally concurred that funding is needed and that the Working Group should recommend the legislation make it available.

Co-chair Wallace Ishibashi points out that there are two projects the Working Group recommends be funded: first, testing and identifying specific locations that hold promise to be geothermal generation sites and second, analyzing the impact of transition to geothermal upon the existing infrastructure. Resource analysis and impact assessment.

Community benefits discussion concerning the best approach and advisors to consult. Community benefits can include Volcanoes National Park hydrogen buses and agricultural fertilizer.

Member Robert Lindsey identifies the resources and people who will be supplying information for the community benefits section. Recommend to the legislation that royalties from geothermal be identified and ear-marked for local community benefits rather than going into the general fund.

Co-chair Wallace Ishibashi asks about royalties calculation and distribution. The legislation will have to address the percentage distribution when it comes up.

Member Barry Mizuno explains that the royalty is calculated according to the value of the resource using a formula developed by DNLR and the US Department of Interior; from that figure, 10 percent of the resource value is designated royalty.

Member Nelson Ho asks Richard Ha about IDG and the consortium who wants to develop geothermal.

Co-chair Richard Ha replies that the general idea seems good, but it is too early and nothing substantial has been done yet.

Meeting adjourned.

Appendix D

Activities to Date

Geothermal Working Group members attended monthly round-table discussions

Geothermal Working Group members prepared an Interim Report

Geothermal Working Group members toured HELCO power plant July 15, 2010

Geothermal Working Group members toured PGV power plant August 26, 2010

Richard Ha attended the **7th Annual NH3 Fuel Conference** in Detroit, MI Sept. 26–28, 2010

Richard Ha attended the **2010 ASPO-USA Peak Oil Conference**: The Future of Oil, Energy and the Economy in Washington, D.C. October 7-9, 2010

Energies **2009**, *2*, 25-47; Review **What is the Minimum EROI that a Sustainable Society Must Have?** by Charles A. S. Hall, Stephen Balogh and David J. R. Murphy

Wallace Forbes, 09,13,10; Review **Bracing For Peak Oil Production By Decade's End**, and interview with Charles Maxwell, senior energy analyst.

Review Platts News Service report by Leslie Moore, on the **ASPO Conference in Washington, DC - Peak Oil**

Analyze the latest material on emerging risk in the energy sector by **Lloyd's of London Insurance**; **360 Risk Insight**, a peer-reviewed White Paper by Antony Froggatt and Glada Lahn.

Co-chairs Wallace Ishibashi and Richard Ha participated in panel discussions in Kona and at the University of Hawaii, Hilo.

Co-chair Richard Ha participated with Kale and Robbie Alm and a Native Hawaii Legal Corp attorney on a geothermal panel at the Association of Hawaiian Civic Clubs in Kona.

Kanoe Wilson, University of Hawaii, Office of Student Affairs, First Nations' Futures Program Fellowship. Kamehameha Schools instituted program to improve management of First Nations' assets. Promote awareness through education of risks and rewards of developing geothermal; outreach which is still continuing.

Co-chair Richard Ha gave presentations to the Waimea and Keaukaha Community Associations, the Rotary Club of Waimea, and the Lions Club of Hilo.

Co-chair Wallace Ishibashi, Mike Kaleikini, Mililani Trask and co-chair Richard Ha appeared on Solar Radio. Richard Ha has been appeared on that program discussing geothermal three times.

Co-chair Wallace Ishibashi and co-chair Richard Ha gave presentations at the University of Hawaii, Hilo conference on Geothermal Energy May 28, 2011.

Co-chair Wallace Ishibashi and co-chair Richard Ha gave presentations at the Home-Grown Energy Forum, Saturday, August 27, 2011 at Hawaii County's Aupuni Center.

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at BILA Geo Committee,September 18, 2010

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Kona Community,Outrigger Keauhou, October 22, 2010

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Hilo UH, October 25, 2010

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at UCB 127 Hilo Moku Power, February 5, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Kona Community, February 8, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Puna Community IDG, April 8, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at BILA Labor, April 18, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Hilo Community, UH, May 28, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Oahu State Legislatures, July 7, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Maui Community, IDG, July 20, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Hilo Community, August 27, 2011

Co-chair Richard Ha gave a presentation at Waimea Community, IDG, September 21, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Kona Community, IDG, September 22, 2011

Appendix G

Energy Return On Investment by Dr. Charles A. S. Hall

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What is the Minimum EROI that a Sustainable Society Must Have?

Charles A. S. Hall, Stephen Balogh and David J. R. Murphy

Economic production and, more generally, most global societies, are overwhelmingly dependent upon depleting supplies of fossil fuels. There is considerable concern among resource scientists and many economists that decisions made about the future of energy, based on today's prices, could have dire consequences. The rise in petroleum prices between 2005 and 2008 that lead to the related market collapse of 2008 provided one indication of the short-comings of future predictions based on current market prices. A different method used to calculate the cost / benefit ratio of energy resources is: Energy Return On Investment (EROI). It provides a more rigorous approach to examining advantages and disadvantages of different fuels and also offers the possibility to look into the future in ways that markets seem unable to do. One important goal of the Geothermal Working Group Interim Report is to assess the minimum return-on-investment that must be attained from Hawaii's energy resources in order to support optimum social and economic activities. We surmise that for any system to survive, grow, and thrive, it must gain substantially more energy than it uses in obtaining that energy. Thus, Hawaii must abide by the principles that can be calculated using the Law of Minimum EROI for fossil fuel, which has been calculated at about 3 to 1 (the cost to drill, refine and deliver petroleum is three times greater than the benefit of use in farming, driving, producing electricity, etc.).

Today's prices are not influenced by tomorrow's conditions; the most abundant fuels will be less available -- for either geological (depletion) or political reasons -- in the future. In addition, current prices of energy in the U.S. are greatly influenced by various subsidies. The end of cheap oil might be, or soon might be, upon us. Meanwhile, gasoline prices, although high in nominal terms, just about peaked in 1981. Corrected for inflation, what we now pay for gasoline in a year is a smaller proportion of our income. Given that our island society is overwhelmingly dependent upon oil, this is cause for concern. The price at the pump or the price of a barrel today is a false indicator of true reserves and future market costs. Current conditions are an unreliable basis for projections and planning.

Net energy analysis is called the assessment of energy surplus, energy balance, or, energy return on investment (EROI). EROI is calculated from the following simple equation:

EROI = Energy returned to society vs. Energy required to get that energy

For most fuels, especially alternative fuels, the energy gains are reasonably well understood, but the boundaries of the denominator, especially with respect to community reaction and environmental issues, are poorly understood and even more poorly quantified. Survival, comfort, wealth, art and even civilization itself is a product of surplus energy. The ability of a given society to divert attention from life-sustaining needs, such as agriculture or the attainment of water, towards luxuries such as art and scholarship is based on the quantity and quality of surplus resources. Indeed, humans could not possibly have made it this far, or even from one generation to the next, without there being some kind of net positive energy.

Energy comes from many sources – from imported and domestic sources of oil, coal and natural gas, as well as hydropower and nuclear, and renewable energy – increasingly from wind, solar, geothermal, etc. Most of these are cheaper per unit energy delivered than oil. Globally, for every barrel of oil invested in seeking and producing more oil, some 20 barrels are delivered to society. Thus, fossil fuels still provide a very large energy surplus, obviously enough to run and expand the human population and the very large and complex industrial societies around the world.

That's the good news. The bad news is that the depletion of fossil fuels has been occurring since the first ton of coal or barrel of oil was mined. Since these fuels need about 100 million years to regenerate, depletion and technology are in a race. Either technology, the market and economic incentives will continue to find oil to replace that which we have extracted, or the prices will increase as oil reserves deplete and society must find substitutes when new technologies develop.

Furthermore, there is considerable evidence that, in the case of oil, we are mostly just pumping out old fields rather than replacing extracted oil with newly found oil. Globally, we are using between 2 to 3 barrels for each new barrel found. If current trends continue linearly, then in about two to three decades it will take one barrel of petroleum to find and produce one barrel of petroleum. Oil will cease to be a net source of energy. This means that the question is not necessarily what the size of global oil reserves is, but rather what is the size of that portion that is extractable with a positive net energy value? In the case of alternative resources the question is: at what rate can high EROI fuels can be produced. The implications of this are obvious, huge, and make an argument for seeking substitutes earlier rather than later. But, the problem with the alternatives is to find ones with the desirable traits of fossil fuels: 1) sufficient energy density 2) transportability 3) relatively low environmental impact per net unit delivered 4) relatively high EROI and 5) producible on a scale that society demands.

Economic Realities

At the time of this writing, a barrel of oil on the New York market is about $86. Assume that the *real price* of oil, that is, the price of oil relative to other goods and services, increased to $140 a barrel. If that happened, then $2.38 trillion, one fifth of the economy, would be used to buy the oil to run the other four fifths -- *not including* the energy-extraction system itself. If the price of oil increased to $250 per barrel, about one third of all economic activity would be required to run the other two thirds. At $750 a barrel, the output of the entire economy, $12 trillion dollars, would be required to generate the money to purchase the energy required to run the economy. There would be no net output. In a real economy there would be adjustments, alternative fuels and nuances. However, this analysis does give an overview of the relation between gross and net economic activity, as well as the vital role of energy. As the price of fuel increases, its EROI declines, and there are large impacts on the rest of the economy. These impacts can be especially influential because changes in the price of energy tend to impact discretionary, not base, spending.

Oil refineries use roughly 10 percent of the energy in fuel to refine it to the form that we use. In addition, about 17 percent of the material in a barrel of crude oil ends up as other petroleum products, not fuel. So for every 100 barrels coming into a refinery only about 73 barrels leaves as usable fuel. Natural gas does not need such extensive refining, although an unknown amount needs to be used to separate the gas into its various components and a great deal, perhaps as much as 25 percent, is lost through pipeline leaks and to maintain pipeline pressure. Coal is usually burned to make electricity at an average efficiency of 35 - 40 percent. What this means is that at least 1.27 units of crude oil are added to the cost to deliver 1 unit as a fuel.

Oil weighs roughly 0.136 tons per barrel; transportation by truck uses about 3400 BTU/ton-mile. Thus, it costs about 5% of the total energy content of a barrel of oil to move it to where it is used. Now the calculation for EROI changes to about 40 percent (17 percent non-fuel loss, plus 10 percent to run the refinery, plus 10 percent extraction, plus about 3 percent transportation loss). For oil one needs an EROI at the mine mouth of roughly 1.4 to get that energy to the point of final use.

What our society needs, however, is energy services, not energy itself, which has little intrinsic economic utility. So we must count in our equation not just the *upstream* energy cost of finding and producing the fuels themselves, but all of the *downstream* energy required to deliver the service (in this case transportation): 1) building and maintaining vehicles, 2) making and maintaining the roads used, 3) incorporating the depreciation of vehicles, 4) incorporating the cost of insurance, 5) etc. Our calculation, adding in the energy costs of getting the oil in the ground to the consumer in a usable from (40 percent) plus the pro-rated energy cost of the

infrastructure necessary to use the fuel (24 percent) is 64 percent of the initial oil in the ground. Thus, the energy necessary to provide the services of 1 unit of crude oil at the gas station or the electrical generator is roughly 3 units of crude oil. This cuts our EROI to 3:1 for a gallon at final use, since about two thirds of the energy extracted is necessary to do the other things required to get the service from burning that one gallon. Include the energy cost of supporting labor or compensating for environmental destruction and this ratio increases substantially. In the final analysis, even before factoring in the inefficiencies of transforming fossil fuel to electricity and delivering it to homes and businesses, the current method of electrical production is simply not sustainable.

Appendix H

Charles Maxwell, Senior Energy Analyst at Weeden and Company
Interviewed by Wallace Forbes

Maxwell: The use of petroleum in the world is now up to about 30 billion barrels per year. The rate at which we have found new supplies of petroleum over the last 10 years has fallen to an average of only about 10 billion barrels per year.

We're obviously in an unsustainable situation. We are now using up a greater number of barrels that we have found in the recent past and that we have reserved in the ground. We are now beginning to use it up relatively quickly--with scary consequences for the future.

The peak of production usually comes sometime between 30 and 50 years after the peak of finding oil. "The peak of discovery," as they call it. For instance, in the North Sea, the peak of discovery was in the late 1960s, and the peak of production was in the late 1990s. So it was around 30 years between the peak of finding oil and the peak production of that oil.

Forbes: From those sources in the North Sea?

Maxwell: Yes. In the United States, the actual peak of discovery was 1931, quite a bit earlier. We were the first country to actually peak in the world of oil production. Our peak of production came in late in 1970. So that was a 39-year transition from the peak of finding the oil to the peak of producing it.

Now the question remains in front of us, has the world peaked in its level of discovery and if so, how long will it take the world, if it has peaked, to reach the peak of oil output? I believe that the peak of discovery fell in the five-year interval between 1965 and 1970. So if you took it at, say, 1968, and then you added 50 years, you would get to 2018.

Forbes: Is technology reducing the time between finding and producing oil?

Maxwell: Technology is trying to give us the ability to produce more out of a giant field. In the early days we only produced about 25%. Today we're producing about 40% of the oil in place when a field is found. These numbers are gaining rather slowly now. What's happening is that the increase in the world's population and greater use of oil in transportation, particularly in the emerging countries, is working to lift oil demand, and that spurs us to drain a field more quickly, but not necessarily to get a higher proportion of oil out of it. So we have technology improving production capability, but actually taking the oil out faster rather than getting much more out. I cannot tell you whether we are lengthening the life of a field very much in these times. It's a slow process, at best.

Appendix I

Association for the Study of Peak Oil & Gas Conference
Washington, DC (Platts News Service) - Leslie Moore Mira

A panel of geologists and energy analysts debated Thursday the severity and timing of an anticipated oil crisis, with one saying during a Washington briefing that crude oil production has now peaked.

"The global rate of production of oil is peaking now,"said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin. "The size of accumulation [of oil] is not equated to the rate of production," he said. Frank Rusco, an energy director at the US Government Accountability Office, estimated some 45 years of "proven reserves," though current and future oil demand will stress supplies.

"Higher oil prices can retard economic growth and even cause a recession in the right circumstance," Rusco said at the briefing, which was organized by the Association for the Study of Peak Oil and Gas. He declined to say after the briefing what a gasoline price ceiling might be for US consumers.
"The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," Rusco said, citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper." Meanwhile, "mitigation of oil dependency by transitioning into other energy sources will take upward of a decade to come into play. "Sometime after a decade, mitigation will take impact and things will start to flatten out," Hirsch said.

New reserves from Brazil and production from unconventional sources in the US will not be enough to compensate for depleting reserves, panelists said. The Ghawar oil field in Saudi Arabia, still a bright light in the petroleum world, could see a sharp and imminent decline in production, Patzek said. If Ghawar "peters out, to replace it [with production elsewhere] will be a very difficult task," he added. He estimated Ghawar's current production at between 4.5 million and 5 million barrels per day, though added that actual production figures are unknown as they are a "top secret."

Later, on the sidelines, Patzek said Ghawar could become the region's Cantarell, referring to Mexico's offshore oil field that has seen production plummet by over half from a peak 2.1 million barrels per day in the mid-2000s. Patzek said that the ongoing water-flood efforts into the

Ghawar field to stimulate production will eventually taper off. "You're injecting twice as much water into the well," he said. "Your field is watering out," Patzek said in an interview Patzek told the briefing that Norway's reserves have peaked, while he characterized the decline rate in the US Gulf of Mexico as "very high." BP's Thunder Horse well in the Gulf "has not reached its potential and it's declining faster than people thought," Patzek said. A BP spokesman was not immediately available for comment on Patzek's remarks about Thunder Horse.

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference. "This is not a recovery that we're in," said Nicole Foss, a former fellow at the Oxford Institute for Energy Studies, who predicted "chaos" in foreign currency and equity markets within years. A severe deflationary plunge will contribute to a liquidity crisis among the financial sector, Foss said on a peak oil panel late last week. The meeting in Washington wrapped up Saturday.

"Oil will bottom early in this depression," Foss said. She and fellow panelist, energy analyst, Chris Martenson, predicted that foreign currency markets will become more volatile, with domino effects on global money supply. "It's not unthinkable the the US will have another financial crisis," Martenson said, adding that he gave the US a "50%" shot at having a fiscal crisis and a "50%" chance of experiencing a currency crisis. "We're going to see severe dislocations in the foreign exchange markets."

Deflation is tomorrow's problem," Foss said, adding that a lack of purchasing power will undermine price support for crude oil. Then "printing [money] is a few years off," she said. "We could see $20 per barrel and then $500 per barrel within the space of five years," Foss said. Foss runs the Agri-Energy Producers' Association of Ontario, where she has focused on farm-based biogas projects and grid connections for renewable energy. At Oxford, she researched electricity policy at the EU level, according to her website. She was previously editor of the Oil Drum Canada, where she wrote about peak oil and finance.

Speaking on the sidelines of the conference, Foss said that natural gas holds no promise as a safe hydrocarbon haven in a scenario of volatile crude oil prices. There is a "perception of a glut" of natural gas reserves and other resources from new shale plays and coal-bed methane and tight formation gas Foss said. "I would argue that this is an illusion," Foss said. The environmental cost of extracting unconventional resources "is tremendous," Foss said, adding that the energy resource "bang for buck" is unappealing. "We'll end up with natural gas price spikes, "after years of low natural gas prices," she said.

Appendix J

Strategic Risks and Opportunities for Business
Lloyd's of London White Paper

The Energy, Environment and Development Program (EEDP) at Chatham House advances the international debate on energy, environment, resources and development policy.

Author, Antony Froggatt, is a Senior Research Fellow at Chatham House. He has worked on international energy and climate issues for over 20 years.

Co-author, Glada Lahn, is a Research Fellow specializing in energy governance and development issues. She has published papers on Asian energy and is researching energy policy in the Gulf.

Overview

Independently of what happens in UN negotiating rooms, the US Congress, or multi-national corporate board rooms, Hawaii's legislature and Hawaii's businesses can take action. We can plan our energy needs, we can make every effort to reduce consumption, and we can aim for a mix of different energy sources. The transformation of the energy environment from carbon to clean energy sources creates an extraordinary challenge for our island. We can expect dramatic changes: prices are likely to rise, with some commentators suggesting oil may reach $200 a barrel; regulations on carbon emissions will intensify; and reputations will be won or lost as the public demands that big energy users and suppliers reduce their environmental footprint.

1. Energy security and environmental concerns are unleashing a wave of policy initiatives and investments that will fundamentally alter the way that we manage and use energy.

2. Modern society has been built on the back of access to relatively cheap, combustible, carbon-based energy sources. Three factors render that model outdated: surging energy consumption in emerging economies, multiple constraints on conventional fuel production and international recognition that continuing to release carbon dioxide into the atmosphere will cause climate chaos.

3. China and emerging Asian economies have already demonstrated their weight in the energy markets. Their importance in global energy security will grow.

4. Energy markets will continue to be volatile as traditional mechanisms for balancing supply and price lose their power. International oil prices are likely to rise in the short to mid-term due

to the costs of producing additional barrels from difficult environments, such as deep offshore fields and tar sands.

5. Much of the world's energy infrastructure lies in areas that will be increasingly subject to severe weather. On top of this, extraction is increasingly taking place in more severe environments such as the Arctic and ultra-deep water. For energy users, it means greater likelihood of loss of power for industry and fuel supply disruptions.

6. Without an international agreement on the way forward on climate change mitigation, energy transitions will take place at different rates in different regions. Those who succeed in implementing the most efficient, low-carbon, cost-effective energy systems are likely to influence others and export their skills and technology.

7. The introduction of carbon pricing and cap and trade schemes will make the unit costs of energy more expensive. The most cost-effective mitigation strategy is to reduce fossil fuel energy consumption.

8. Businesses must address the impact of energy and carbon constraints holistically, and throughout their supply chains. Tight profit margins on food products, for example, will make some current sources unprofitable as the price of fuel rises and local suppliers become more competitive. Retail industries will need to either re-evaluate the 'just-in-time' business model which assumes a ready supply of energy throughout the supply chain.

9. The last few years have witnessed unprecedented investment in renewable energy and many countries are planning or piloting 'smart grids'. This revolution presents huge opportunities for new partnerships between energy suppliers, manufacturers and users.

Introduction

This report looks at short-term (one to five years) and medium-term (five to ten years) risks to general business. It also considers longer-term (ten years plus) issues, particularly as they impact on technological and investment choices for the energy sector. While energy supply disruption is frequently the result of technical faults and strike action, we do not deal with this here, but concentrate instead on the impacts of constraints on carbon and carbon-based resources.

Historically, energy security has meant defending against supply disruption and price instability. Within this mindset, protecting the status quo is paramount. Yet dynamic trends, including the sharp rise in demand from newly industrializing economies, carbon-dioxide induced global warming and the growth of alternative energy technologies, mean that protecting traditional

energy practices will make us *less secure*, and *less competitive*, in the future. This is in addition to the threat that climate change poses to energy infrastructure. These are not issues for the energy sector alone. The return to high and volatile oil prices after 2005 reinforced the link between energy prices, profits and economic stability for most businesses.

Renewable energy has moved into the mainstream and is now supplying the majority of new electricity in some regions. To increase efficiency and allow the uptake of more renewable energy, radically different infrastructures are being planned around the world. These may include local and trans-national 'smart grids' that communicate with household and industrial appliances and electric vehicles, and can send power back into the grid to help regulate demand flows.

There is little sign that energy demand will go down, with forecasts suggesting a 40% increase by 2030. This will require $26 trillion of investment - some 1.4% of global GDP. Given the global commitment to radically reduce emissions and the finite nature of conventional fossil fuel sources, a rapid movement towards a highly-efficient non-fossil energy future would seem to be the logical investment choice.

Trends

With world population growth and pressure for higher standards of living in developing countries, demand for energy will reach new heights. But how long can we rely on these ultimately exhaustible and, with the exception of uranium, C02 emitting fuels? There is now widespread acknowledgement that we are in a 'transition' period heading towards less-polluting, more-sustainable forms of energy. This involves scaling up new technologies and introducing completely different energy delivery systems.

Energy is a globalized commodity. Sudden demand pressures for certain fuels in one place, coupled with previous inadequate investment in the necessary resources elsewhere, will push up prices on the international markets. Before new models of international energy governance are developed, insecurity will encourage strategic investments by the most import-dependent countries. Together with policies to reduce subsidies and increase efficiency, these trends will drive up final consumer prices for transport, fuel, heat and electricity in the short to mid term.

Advanced economies remain the biggest consumers of primary energy per person but by 2008 non-OECD countries, led by China and India, had outstripped them in terms of the share of world demand. These consumption trajectories mean there is likely to be a tipping point in 2015 when countries in Asia-Pacific need more imported oil in total than the Middle East (including Sudan) can export.

In spite of high CO2 emissions per unit of energy (two to three times more CO2 than natural gas when burned in conventional thermal power plants), coal is the fastest growing fossil fuel. Many countries plan to increase the share of natural gas in their national energy mixes as it has lower emissions than coal and oil and is more versatile It can replace coal as a fuel for electricity generation and oil-based transport fuels in gas-to-liquid and compressed forms.

In the developing world, increasing car ownership and subsidized fuel prices will continue to drive up oil demand in the next few years. Whereas fuel-efficiency standards, taxed fuel prices and alternatives, including biofuels, reduce demand in the advanced economies. Peak oil demand (the suggestion that reductions in demand as a result of policy, technology and behavioral changes will occur before any geological driven change) is a distinct possibility in the longer term. Unsustainable consumption trends are forcing many countries, particularly oil exporters, to rethink their energy pricing and subsidy systems to encourage greater efficiency.

Peak Oil

A vast array of studies have attempted to predict the time at which global oil production will reach a maximum level, from which point it will go into irrevocable decline. Some suggest that this 'peak' has already occurred, while others maintain it is either impossible to predict or shows no sign of appearing. Looking further than a decade into the future presents many uncertainties, including: the availability and cost of extraction technologies; substitute technologies; pricing systems in major economies; and carbon legislation. A peak in conventional oil production before 2030 appears likely, and there is a significant risk of a peak before 2020. With average rates of decline from current fields, the report says that just to maintain current production levels would require the equivalent of a new Saudi Arabia coming on-stream every three years. What's more, giant fields pass peak production levels and there is a shift to smaller, more difficult to produce fields that have faster depletion rates meaning the rate of decline will accelerate. Even before we reach peak oil, we could witness an oil supply crunch because of increased Asian demand.

Unconventional oil, including very heavy oil, oil sands, and tar sands (bitumen), has a high viscosity. It flows very slowly and requires processing or dilution to be extracted through a well bore. Very heavy oil in Venezuela, oil sands in Canada, and oil shale in the US account for more than 80% of unconventional resources.

While some oil companies have invested large amounts in non-conventional oil, there are a number of limiting factors, including: environmental impacts; capital and operating costs; and the energy balance of the whole operation (how much energy is required to extract, process and transport the fuel compared to the final product).

The costs, environmental impact and security implications of these options differ and are at the center of fierce debates about the trade-offs between climate and energy security. For example, CO2 emissions from oil sands are at least 20% higher than for oil currently consumed in the US. This is because the energy input (usually in gas) needed to get the oil out is around three times as much as for conventional oil. It also takes three barrels of water to produce each barrel of oil, most of that being too toxic to return to the rivers. Emissions from shale oil are likely to be higher and those from coal to liquids are at least double the levels of those from conventional oil-based fuel. Gas to liquids would produce emissions some 10% to 15% higher than those from conventional gasoline or diesel.

Over a quarter of US oil production and close to 15% of US natural gas production comes from the Gulf of Mexico. In the summer of 2005, Hurricane Katrina shut off what amounted to around 19% of US refining capacity, damaged 457 pipelines and destroyed 113 platforms. Oil and gas production dropped by more than half; causing a global spike in oil prices. Much of the infrastructure destroyed in 2005 was rebuilt in the same location, leaving it vulnerable to similar weather events in the future.

The US Geological Survey estimates that the Arctic might contain over a fifth of all undiscovered oil and gas reserves. Siberia could contain as much oil as the Middle East. However, dreams of a resource bonanza in the north are premature. The environment is difficult and becoming increasingly unpredictable as a result of the changing climate. The thawing of permafrost in the north is already causing infrastructural damage and reportedly costing Russia around $1.9 billion a year to repair infrastructure and oil and gas pipelines in West Siberia.

Renewable Energy

There are a large variety of sources of renewable energies that are available in different concentrations all over the world. These include:

- Heating and cooling: passive solar architecture; solar thermal collectors; biomass-based combined heat and power; and geothermal energy.
- Electricity: solar photo-voltaic; solar thermal; hydro; solid biomass; biogas; geothermal; on and offshore wind; marine energies like sea current, wave and tidal energies.
- Transport (internal combustion-based): bioethanol; biomethanol; oils from biomass; and biomass-based synthetic fuels.

Until the last decade, the commercial renewable energy field was dominated by hydropower for electricity, biomass for heating, and solar thermal for hot water. However, the commercial strength of onshore wind has led to unprecedented growth in this area in a number of regions. This trend is likely to continue, as will the development of solar power for electricity production. The use of biofuels as a transport fuel remains controversial, due to the impact on food prices, land use and water consumption. If the use of biofuels is to be expanded, it is likely to require rapid technology innovation and the use of non-food sources for fuel, such as algae.

The most common critique of wind and solar power is that they both rely on intermittent sources. This means that thermal or nuclear capacity is still needed as back-up to compensate for times when the wind doesn't blow or the sun doesn't shine.

The growth of the current generation of biofuels is expected to slow due to environmental concerns and the impact of such large-scale production on land use and food prices. These concerns have accelerated the development of the next generation of biofuels, which will no longer use potential food sources for the production of ethanol (such as wheat), but farm waste instead. These could become more widespread in the next couple of years. Commercially viable third-generation biofuels from specially farmed plant forms, such as algae, are still at the research stage.

Water flows are fundamental for agriculture, power generation and cooling. Hydropower contributes around 15% of global electricity production, by far the largest of any renewable energy. It relies on the ability to predict the volume of water entering the system. Before construction, care is taken to assess river levels, hydrological cycles and precipitation patterns. Until recently those findings were considered to be constants. However, climate change is expected to cause accelerated changes in the rainfall patterns and what were constants are now becoming variables. This can cause problems for both glacier-dependent and precipitation-dependent power plants.

Challenges and Risks

In spite of broad international agreement on the importance of inventing and deploying technologies to meet energy and climate security goals, progress has been slow. Uncertainties around domestic and international regulations and pricing structures can stall investment, discourage collaborative projects and generally dampen investor confidence. For example, inconsistent policies have entrenched a pattern of boom and bust in the renewable energy and efficiency industries in many parts of the world, including the US.

Over a quarter of US oil production and close to 15% of US natural gas production comes from the Gulf of Mexico. In the summer of 2005, Hurricane Katrina shut off what amounted to around 19% of US refining capacity, damaged 457 pipelines and destroyed 113 platforms. Oil and gas production dropped by more than half; causing a global spike in oil prices. Much of the infrastructure destroyed in 2005 was rebuilt in the same location, leaving it vulnerable to similar weather events in the future.

All of the world's largest energy importers are dependent on sea imported oil. The US imports 60% of the oil it consumes (over 95% delivered by tankers) while the growing markets of China and India import 90% by sea. Japan is almost completely dependent on maritime oil imports. The traffic is increasing as countries require greater energy imports further from their markets.

Key challenges that will affect businesses across the board are:

- Cost and stability of services
- Pressure to reduce carbon emissions
- The transformative changes in the energy sector
- Price and supply
- Regulatory considerations: counting the cost of carbon
- The food industry could be affected by energy disruption - supermarkets tend to keep only a few days worth of perishables on their shelves
- Environmental risks
- Investment risks
- Technology risks
- Operational risks - Infrastructure and systems *not built* to withstand changing environmental conditions will require expensive retrofitting
- With energy production forecast to grow by approximately 45% over the next two decades, water consumption for energy production will more than double over the same period
- Operating in more difficult terrains increases the risk of accidents which have human, environmental and economic consequences.

Conclusion

Energy security is now inseparable from the transition to a low-carbon economy.

Traditional fossil-fuel resources face serious supply constraints and an oil supply crunch is likely in the short-to-medium term.

Of particular importance for new technologies is the risk of constraints on raw materials such as rare earth metals, as scarcity may drive up costs.

Energy infrastructure will be increasingly vulnerable to unanticipated severe weather leading to a greater frequency of brownouts and supply disruptions.

Increasing energy costs as a result of reduced availability, higher global demand and carbon pricing are best tackled in the short term by changes in practices.

The sooner that businesses reassess global supply chains and just-in-time models, and increase the resilience of their logistics against energy supply disruptions, the better.

While the vast majority of investment in the energy transition will come from the private sector, governments have an important role in delivering policies and measures that create the necessary investment conditions and incentives.

Appendix K

Geothermal Development in Hawaii

Compiled by: Tonya L. Boyd, Geo-Heat Center
Donald Thomas, SOEST, University of Hawaii, Hawaii
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Geothermal resources

The Hawaiian Islands lie above a geological "hot spot" in the earth's mantle that has been volcanically active for the past 70 million years, with the island of Hawaii (Big Island) having the most recent activity. The Big Island has an obvious, large potential for geothermal energy resources, both for electrical generation and direct utilization. Since the 1976 drilling of the HGP-A well and the discovery of the Kapoho Geothermal Reservoir in the lower Kilauea East Rift Zone, geothermal power potential on the Big Island has been estimated at between 500 and 700 Megawatts.

Geothermal interest was motivated by the fact that imported oil is used to supply over 90 percent of Hawaii's energy needs. No other state in the U.S. is so critically dependent on imported oil; geothermal was regarded as a renewable source to help make the islands less dependent on imported energy.

The Hawaii Geothermal Resources Assessment Program was initiated in 1978. The preliminary phase of this effort identified 20 Potential Geothermal Resource Areas (PGRAs) using available geological, geochemical and geophysical data.

The second phase of the Assessment Program undertook a series of field studies, utilizing a variety of geothermal exploration techniques, in an effort to confirm the presence of thermal anomalies in the identified PGRAs and, if confirmed, also more completely characterize them.

The island of Oahu, the major population center of Hawaii, is the second oldest major island and was formed from two independent volcanic systems. A preliminary assessment identified six locations where data suggested that a thermal resource might be present. The present assessment of the geothermal potential for Lualualei Valley is that there is a 10 to 20 percent probability of a low-to-moderate temperature resource existing at depths of less than 3 km. The probability of the existence of a moderate-to-high temperature thermal resource within 3 km is less than 5%.

The island of Hawaii, is the youngest and the largest island in the Hawaiian. A number of potential geothermal resources were identified in the preliminary assessment.

- Kilauea East Rift Zone was designated as a Known Geothermal Resource Area due to a productive geothermal well. The probability of a geothermal resource in this area is 100%.
- Kilauea Southwest Rift Zone and has a geothermal resource probability of 100% for a low-to-moderate resource and 70 to 80% for a moderate-to-high resource.
- Mauna Loa area did not exhibit any significant indications of a geothermal resource: less than 5% for a low-temperature resource.
- Kawaihae area is 35 to 45% low-to-moderate resource and less than 15% moderate-to-high.
- Hualalai summit indicated 35 to 45% low-to-moderate resource and 20 to 30% moderate-to-high.

An experimental 3 MW power plant went online in 1982; which, when it was shut down after eight years of production, had an availability factor of 95%. The plant was originally designed as a two-year demonstration project and incorporated several unique characteristics. Because the facility was located in the Kilauea East Rift Zone and therefore, was in a high lava-hazard zone, the turbine-generator set was built on skids, and the building housing the turbine-generator had a bridge crane capable of lifting the turbine-generator unit, so that it could be quickly removed in the event of a lava flow. In addition, the well was housed in a concrete bunker that could be completely enclosed with a set of covers, to allow a lava flow to cover the site without damaging the wellhead. Over the life of the plant, the generator facility produced between 15 and 19 million kilowatt-hours of electricity per year. In 1986 the HGP-A facility was transferred from U.S. Department of Energy ownership to the state of Hawaii and assigned to the Natural Energy Laboratory of Hawaii.

In 1985, the Noi'i O Puna (Puna Geothermal Research Center) was established to support direct use of the waste heat from the brines of the HGP-A well. The Community Geothermal Technology Program (CGTP) was conceived in 1986. The purpose of the program was to support small business enterprises in the Puna District, encourage the use of waste heat and byproducts from HGP-A, and to allow access to the geothermal resource.

The HGP-A power plant was closed in late 1989 on the order of Governor John Waihee and County of Hawaii Planning Director Duane Kanuha. The closure of the power plant was permanent due to the fact that it was no longer accomplishing it's primary goal of demonstrating the benefits of geothermal power. Although the facility was designed for only a two-year demonstration life, it has been operated for nearly eight years. During the interval, inadequate maintenance had taken a severe toll on the reliability and effectiveness of the equipment, and the costs of operation exceeded the revenues being generated. In addition, the effluent abatement systems and the brine disposal processes were neither efficient nor acceptable to the community or the regulatory agencies.

Despite the difficulties that were encountered, the facility accomplished a great deal. It demonstrated that the resource in the Kilauea Lower East Rift Zone was robust: the decline in production from the HGP-A well, over the eight year life of the plant, was only a few percent per year. The facility demonstrated that the reservoir fluids required special handling and maintenance, but also demonstrated that fluid chemistry issues could be managed. Some of the techniques for fluid handling and disposal that were developed and tested at the HGP-A facility were employed by the subsequent commercial power plant and proved key to disposal of their waste fluids.

And, finally, the operations, and missteps, taken at the HGP-A facility, served to sensitize Hawaii's regulatory agencies to issues regarding geothermal development that affect the community. It should also be noted that, with the closure of the power generation activities at the HGP-A, the Community Geothermal Technology Program also was terminated due to loss of the waste heat produced by the generation process

Geothermal / Inter-Island Transmission Project

From 1982 through early 1990, an engineering feasibility project was undertaken to evaluate the technical and economic challenges of installing a large-scale 500-megawatt geothermal/inter-island submarine cable. About $26 million (Federal and State funding) was expended in studies, design, engineering, fabrication, and testing for the Hawaii Deep Water Cable Project. The design criteria stated that the cable would have to withstand the stresses of at-sea deployment (including strong currents, large waves, and strong winds), the undersea environment (including corrosion and abrasion), and be able to reliably conduct electricity for thirty years. Since the Alenuihaha Channel is nearly 2,000 meters deep, both deployment (laying of the cables) and operating environment posed exceptional engineering challenges. The rationale for the project was that the primary source of geothermal energy was on the island of Hawaii, and the major electrical load was on the island of Oahu, where Honolulu is located. The scheme under consideration was to use the geothermal energy to generate power and transmit it to Oahu. At the time it was estimated that up to 500 MW could be used on Oahu, whereas only about 100 MW were needed on the Big Island.

The electricity produced by the project could potentially represent a large portion of the electric power supply for Oahu. Thus, the project would have to provide a reliable supply of electricity. The amount of energy that HECO (Hawaiian Electric Company) would purchase would be dependent on HECO's assessment of the reliability of the project and the availability of the electricity.

Puna Geothermal Venture Power Plant

In 1990, the Puna Geothermal Venture Facility, situated on 25 acres of a 500-acre plot, located 21 miles south of Hilo on the Big Island, replaced the HPG-A facility. This facility is in the geologic region known as the Lower East Rift Zone. Puna Geothermal Venture is the first commercial geothermal power plant in the state of Hawaii and currently is capable of producing about 30 MW of power. The power plant comprises 10 combined cycle ORMAT Energy Convertors (OECs) installed in parallel. Each OEC consists of a Level I topping steam turbine and a Level II organic turbine connected to a common generator.

Puna Geothermal Venture provides nearly a quarter of the power consumed on the Island of Hawaii. That is enough electricity to meet the needs of more than 25,000 residents and visitors. As of April 2002, the power plant has produced a total of 1.9 billion kWh, and displaced a total of 552 tons of oil.

In 2000, Puna Geothermal Venture announced its intention of doubling its electrical generation capacity from 30 MW to 60 MW. The wells supply geothermal steam at high pressure which must be reduced with valves before the steam goes through the generators. Puna Geothermal Venture plans to place an 8 MW generator at the well to reduce pressure to the other generators while producing power. In the long run, the company can increase capacity to 50 MW without any new wells.

In 2001, Puna Geothermal Venture was chosen to operate the Puna Geothermal Research Center (Noi'i O Puna) facility by the Natural Energy Laboratory of Hawaii Authority. Puna Geothermal Venture proposed continued power production while also developing new production capabilities without drilling new wells. They plan to solicit proposals from entrepreneurs and sell them geothermal energy. PGV will refurbish and expand the visitor center and will also make reasonable efforts to solicit proposals from the public for the development, construction, operation and maintenance of a geothermal heat source on the property. PGV will market facilities to transfer surplus heat from their geothermal facility and within the Noi'i O Puna facility for geothermal related businesses of local entrepreneurs.

Regulation Impediments

The regulatory regime seems to be quite complex. There is the Geothermal Resource Subzone (GRS) Assessment and Designation Law (Act 296, SLH 1983), the Hawaii County Planning Commission's Rule 12, and Act 301, SLH 1988 just to name a few.

The Geothermal Resource Subzone Law stated that the exploration and development of Hawaii's geothermal resources are of statewide benefit and this interest must be balanced with preserving Hawaii's unique social and natural environment.

Three Geothermal Resource Subzones were designated by the Board of Land and Natural Resources after evaluating a number of factors including social and environmental impacts. The subzones total 22,300 acres in the middle and lower Kilauea Rift Zone and 4,000 acres in the Haleakala Southwest Rift Zone.

Public-Acceptance Hurdles

The development of geothermal energy in the Kilauea East Rift Zone has stirred a significant amount of controversy. The experimental HGP-A power plant was not perceived as a "good neighbor" due to emission releases, the extent of brine ponds beyond the plant boundaries, and an unkempt appearance of the plant itself because of limited maintenance. Further exploration was opposed, often vehemently, by people expressing concern over various issues, including impacts on Hawaiian cultural and religious values, potential geologic hazards, public health, and loss of native rainforest, as well as changing the rural nature of Puna. During the establishment of the Puna Geothermal Venture plant, an episode of planned open venting and a number of uncontrolled steam releases stimulated the evacuation of some nearby residents and enhanced fears that the resource could not be safely tapped.

Since the PGV plant has been operating for a decade, most Hawaii residents have accepted it as part of the power supply. However, there is continued concern about health and environmental issues among some residents near the plant which have resulted in investigations by the US Environmental Protection Agency and a program documenting residents' health problems, which they attribute to geothermal emissions. The relationship between PGV and its neighbors appears to have improved with better communication between the company and the adjacent residents.

Among the issues which have concerned geothermal opponents are:

- Interference with worship of the Goddess Pele
- Interference with certain Native Hawaiian practices Rainforest destruction
- Possible health and safety impacts
- Disruption of the way of life for nearby residents
- Hydrogen sulfide and other air quality issues
- Noise
- Increased strain on an inadequate infrastructure
- Impact on native fauna and flora

Opposition Issues

According to state regulations, the exploration and development of geothermal resources can be permitted within conservation, agricultural, rural, and urban areas. The vast majority of resources are located in predominantly rural areas and in some cases, geothermal resources may be present in more primitive tracts where direct human impacts or occupation are minimal such as the Wao Kele O Puna rainforest. In the former case, many of the residents of these rural areas moved there to escape urbanization and industrialization of more populous counties of states (e.g., Honolulu, California), and the implementation of an industrial activity–the generation of geothermal power–was completely contrary to their lifestyle. In the latter situation, the installation of power production facilities in the rainforest–even one degraded by invasive exotic/non-native plants and animals–was equally offensive to other interest groups in the state.

An uncontrolled venting incident in June 1991 at the Puna Geothermal Venture project on the Big Island released hydrogen sulfide and other gases, and gave ample validation to the concerns of the area residents regarding the adverse impacts of this development on their communities. As a result of the "blowout," a Geothermal Management Plan was developed that has enabled state and county agencies to better regulate geothermal activity and enforce permit conditions.

Nonetheless, geothermal wells are sometimes vented intentionally for a few hours to clear the well and pipelines resulting in a temporary release of steam and abated gases. These events can be noisy for a short time and, in addition, the power plant equipment (e.g., cooling tower fans, pumps, etc.) do emit continuous low-level noise during normal power plant operations. Hence, some impact on the community from power production is inescapable; it serves as a continuous irritation to those who feel that their environment has been invaded by industrialization.

A more intangible objection was also raised by some native Hawaiians who claimed that the development of geothermal power was interfering with their worship of Pele, the Goddess of volcanoes. These objections were taken as far as the U.S. Supreme Court, who found that geothermal development does not interfere with religious freedom.

The disputes over the development of a geothermal industry in Hawaii culminated in several actions by the state and the geothermal opponents that effectively ended any serious effort to develop any significant geothermal production capacity on the island of Hawaii, or in the state at all.

In 1991, there were two entities actively pursuing development of the geothermal resource on the Kilauea East Rift Zone: Puna Geothermal Venture on the lower rift, and True Geothermal Energy

Company in the middle rift area. The former was in the process of constructing their power plant and proving up their resource; whereas, the latter, having spent about 10 years struggling with the regulatory environment, was in the process of drilling the first of their exploration wells. When Puna Geothermal Venture lost control of one of their wells during drilling and allowed the uncontrolled release of steam from their exploration well, the state regulatory agencies suspended–indefinitely–the geothermal drilling permits of both Puna Geothermal Venture as well as the True Geothermal Energy Company. The latter company interpreted the loss of their permits–even though they were in compliance with their permit conditions–as an indication of waning political support for geothermal development by the state political powers. This loss of support, as well as less than hoped-for success in their exploratory drilling, ultimately led to their abandonment of further efforts to develop their project on the middle rift subzone.

The second event that further eroded momentum for the geothermal program resulted from an effort by the state to obtain additional federal support for the combined geothermal/inter-island cable program. In this effort, the state presented all of the state- and federally-sponsored research, development, and demonstration activities up to that date as a single unified program designed to lay the foundation for large-scale, 500-megawatt-development of Hawaii's geothermal resources. Although this strategy was intended to rationalize significant, additional federal investment in the RD&D effort, it had unexpected and adverse consequences.

Soon after the state presented the program as a unified effort, the Sierra Club Legal Defense Fund brought suit against the state and the U.S. Department of Energy in an effort to force the relevant agencies to conduct a Federal Environmental Impact Statement on the full 500-MWe development. The U.S. DOE expended -$5 million in an effort to conduct an EIS, but made minimal progress in meeting the demands of the geothermal opponents. Ultimately, the state and DOE settled with the plaintiffs in the suit by signing a "consent decree" that effectively barred the Hawaii governor–for the duration of his term in office–from providing support to any program that would further the state's objective of developing large-scale geothermal power production or transmission inter-island. The state's capitulation to the demands of the opponents, as well as a declining real cost of petroleum for electrical power production, effectively ended any serious effort to develop geothermal power generation beyond that of the Puna Geothermal Venture efforts on the lower east rift zone.

Nearly a decade has passed since many of these events occurred. Puna Geothermal Venture was, however, able to bring a 35-megawatt power plant online–after many delays and much greater costs than had been anticipated by their original investors. Although technical challenges remain a significant concern in the operation of this facility, it has managed to produce power with a minimum of steam releases into the community and a minimum of public controversy.

And the company has been able to obtain permits to expand their production to 60 MWe. However, there are no current plans to expand their production capacity, and there is little serious discussion given to significant expansion of geothermal capacity either on the island of Hawaii or elsewhere in the state. Undoubtedly, this situation is the result of the currently low cost of petroleum–in "real" dollars–but is also in recognition of the severe regulatory and political risks any new investment in significant geothermal production capacity would face in Hawaii today.

Renewable Portfolio Standard

A Renewable Portfolio Standard (RPS) is a policy to encourage the use of renewable energy sources. It sets minimum targets for the production of electricity generated from renewable resources. The aim is to ensure deployment of renewable energy to enjoy the benefits of reduced energy costs, reduced exposure to the economic effects of volatile oil markets, risk management by diversifying generation options, job creation and economic benefits, and environmental benefits.

The state of Hawaii has an extremely high dependence on imported fuels for energy; 90% of the energy supplies are imported oil and coal. Therefore, increased use of renewable energy would achieve increased energy security, reduce some of the environmental risks associated with fuel transport, and reduce the flow of money out of the state. The cost of electricity in Hawaii is the highest of any state in the United States with average price per kWh in September 2000 of $0.144 -- that's over twice the U.S. average price per kWh of $0.0691.

Not only were Hawaii's electricity prices per kWh the highest in the nation in October 2000, electricity revenues per kWh for Hawaii utilities grew much faster than the U.S. average over the years since 1990. Hawaii's revenues per kWh were 59.6% higher than the average for 1990 while the U.S. average was only 3.3% higher. For comparison, Honolulu consumer prices increased about 25.5% from 1990 to 1999.

Electric utilities in Hawaii are "regulated monopolies" meaning they are allowed to operate without competition, but must follow rules set by the Public Utilities Commission. By adopting a renewable portfolio standard, the use of renewable energy becomes one of those rules.

Hawaii's dependence on fossil fuels is expected to grow over the coming decade unless action is taken to increase the use of renewable energy. In 1999, Hawaii's four electric utilities sold 9,373.8 Gigawatt hours (GWh) of electricity. Statewide, utilities forecast that electricity sales will grow at an average annual rate of 1.6% during the 1999 through 2010 period, reaching approximately 11,192 GWh in 2010.

In 1999, renewable energy (geothermal, municipal solid waste, bagasse, landfill methane gas, hydro and wind) was used to produce 7.2% of the electricity generated for sale by the four electric utilities. Renewable energy generation capacity was reduced in 2000 by the closure of Lihue Plantation on Kauai and Pioneer and Paia Mills on Maui. If the remaining renewable energy resources in operation at the end of 2000 continue in operation through 2010, they will provide an estimated 642 GWh of sales during each year of the period. This will amount to approximately 6.6% of total electricity sales in 2001. As electricity demand grows, the percentage of electricity sales from renewable resources will decline to approximately 5.7% statewide by 2010.

Hawaii has an abundance of renewable energy resources. Several studies have shown that at least 10.5% of Hawaii's electricity could be generated from renewable resources by 2010 with no increase in cost to Hawaii's residents.

Increased use of renewable energy sources through the implementation of a RPS can result in many benefits to Hawaii including:

- Reduced cost of fuel for electricity generation
- Reduced reliance on imported oil supplies and exposure to oil market prices
- Risk management by diversifying the portfolio of electricity generation options
- Job creation and economic benefits
- Environmental benefits

Conclusion

There is still resistance to using geothermal energy by some members of the local community, even though the issues noted above have been -- and continue to be -- addressed by government and PGV. However, there are well organized groups (such as the Pele Defense Fund, Rain Forest Action Network and other community organizations) that continue to express concern about the abilities of government and developers to provide socially and environmentally sound geothermal power. Furthermore, the level of support given by the state's political establishment to expansion of geothermal capacity remains vanishingly small. There is presently only funding for one geothermal staff person at the state level.

Appendix L

Warranty Deed and Grant of Access Easement, July 11, 2006

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WARRANTY DEED AND GRANT OF ACCESS EASEMENT

KNOW ALL MEN BY THESE PRESENTS:

THAT, effective as of the __ day of _____, 2006, **THE TRUST FOR PUBLIC LAND**, a California nonprofit public benefit corporation, whose address is 116 New Montgomery Street Third Floor San Francisco, California 94105, hereinafter referred to as "Grantor" and the **OFFICE OF HAWAIIAN AFFAIRS**, a body corporate and instrumentality of the State of Hawai'i, whose address is 711 Kapi'olaniBoulevard, Suite 500, Honolulu, Hawai'i 96813, hereinafter referred to as the "Grantee," for a valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor does hereby grant, bargain, sell and convey unto Grantee, its successors, assigns and representatives, in fee simple, those certain parcels of land situate at Puna, Island and County of Hawaii, State of Hawai'i, designated as "Wao Kele o Puna," containing an area of ± 25,855.891 acres, more particularly described in Exhibit "A" attached hereto and made a part hereof.

TOGETHER WITH a non-exclusive easement for access purposes granted to The Trust for Public Land, a California nonprofit public benefit corporation by C.R. Churchill, D.A. Heenan, Richard W. Gushman, II and Ronald J. Zlatoper, the duly appointed, qualified and acting Trustees Under The Will And Of The Estate Of James Campbell, Deceased, acting in their fiduciary and not in their individual capacities, by that certain Grant of Easement for Access Rights made as of July 14, 2006 and recorded in the Bureau of Conveyances of the State of Hawai'i ("Bureau of Conveyances") on July 14, 2006 as Document Number 2006-129681, over, across and through the road shown on the map attached hereto as Exhibit C-1 and incorporated herein by reference, which crosses the property described in Exhibit C-2 attached hereto and incorporated herein by reference, for the benefit of both Tax Map Key Nos. (3) 1-2-010-002 and 003, subject to the terms and conditions set forth therein.

AND the reversions, remainders, rents, income and profits thereof, and all of the estate, right, title, and interest of the Grantor, both at law and in equity, therein and thereto.

TO HAVE AND TO HOLD the same, together with all improvements, rights, easements, privileges and appurtenances thereunto belonging or in anyways appertaining or held and enjoyed therewith in fee simple unto said Grantee, the Grantee's successors and assigns, forever, free and clear of all liens and encumbrances except as described on Exhibit "B" attached hereto.

The Grantor, for itself, its successors and assigns, does hereby covenant with the Grantee, its successors and assigns, that the Grantor is lawfully seised in fee simple and possessed of the above-described land and premises, that it has a good and lawful right to convey the same as aforesaid, that the same is free and clear of all liens and encumbrances, except as noted on Exhibit "B" and that it will and its successors and assigns, shall WARRANT AND DEFEND the same unto the Grantee, its successors and assigns, forever, against the claims and demands of all persons whomsoever.

AND the undersigned hereto agree that this instrument may be executed in counterparts, each of which shall be deemed an original, and said counterparts shall together constitute one and the same instrument, binding all of the parties hereto, notwithstanding that all of the parties are not signatories to the original or the same counterparts. For all purposes, including, without limitation, recordation, filing and delivery of this instrument, duplicate, unexecuted and unacknowledged pages of the counterparts may be discarded and the remaining pages assembled as one document.

SIGNATURE PAGE TO FOLLOW

IN WITNESS WHEREOF, the parties have executed this instrument as of 11th day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By Ben R. Kudrow

Its REGIONAL COUNSEL

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

IN WITNESS WHEREOF, the parties have executed this instrument as of 13th day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By _____

Its _____

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

ACKNOWLEDGEMENT

State of California
County of San Francisco

On this 11th day of July, 2006, before me, **Hsiao-Wen Shih**, a notary public, personally appeared **Brian R. Kirchoff** personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~) and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

HSIAO-WEN SHIH
COMM. #1556962
Notary Public-California
SAN FRANCISCO COUNTY
My Comm. Exp. Mar 4, 2009

Appendix N

Development of Iceland's geothermal energy potential for aluminum production
– a critical analysis
Jaap Krater and Miriam Rose

Abstract

Iceland is developing its hydro and geothermal resources in the context of an energy master plan, mainly to provide power for expansion of the aluminium industry. This paper tests perceptions of geothermal energy as low-carbon, renewable and environmentally benign, using Icelandic geothermal industry as a case study.

The application of geothermal energy for aluminium smelting is discussed as well as environmental and human rights record of the aluminium industry in general. Despite application of renewable energy technologies, emission of greenhouse gases by aluminium production is set to increase.

Our analysis further shows that carbon emissions of geothermal installations can approximate those of gas-powered plants. In intensely exploited reservoirs, life of boreholes is limited and reservoirs need extensive recovery time after exploitation, making geothermal exploitation at these sites not renewable in the short to medium term. Pollution and landscape impacts are extensive when geothermal technology is applied on a large scale.

Background

Iceland is known for its geysers, glaciers, geology and Björk, for its relatively successful fisheries management and its rather unsuccessful financial management. But this northern country also harbours the largest remaining wilderness in Europe, an endless landscape of volcanoes, glaciers, powerful rivers in grand canyons, lava fields, swamps and wetlands teeming with birds in summer, and plains of tundra covered with bright coloured mosses and dwarf willow.

In 2006, 57 km2 of one of the most magnificent areas of the country, the wild highland plateau north-east of the large Vatnajokull glacier, was inundated for Europe's largest hydro complex, the 690 MW Karahnjukar dams. The energy from the dams went to a single new aluminium smelter built by the American transnational corporation Alcoa. On the day of the flooding, 15.000 people (out of a population of 320.000) demonstrated against the project. The protests against the

Karahnjukar dams launched a wider movement aimed at protecting Iceland's wilderness from heavy industry.

Icelanders, who had been divided over the perceived costs and benefits, were shocked by the devastation wrought by the project. Since the flooding, strong winds in the highlands have eroded silt from the rising and falling water table and dust storms are affecting an area much vaster than the reservoir. Mud rains fall in the East fjords where many local industries closed after the smelter was built. Seal colonies in the delta of the dammed rivers are diminished and some of the most important breeding grounds of vast colonies of rare skua, geese and duck species are gone. 3% of the Iceland's landmass is affected by the Karahnjukar project2. Impact of large dams on climate has been found to be higher than previously assumed due to methane emissions from reservoirs3 and it has recently become clear that this is also significant for high latitude reservoirs such as Karahnjukar4. Damming Iceland's glacial rivers prevents the flow of mineral rich silt (containing calcium and magnesium) to the sea. These nutrients feed marine phytoplankton, the start of most marine food chains. The damming of Iceland's glacial rivers not only decreases food supply for fish stocks in the North Atlantic, but also impacts oceanic carbon absorption, and therefore the global climate5.

The promise of environmentally friendly hydropower turned out to be a false one for the dams in east Iceland. Now, similar promises are being made for geothermal energy as a clean power source. In this chapter we review the development of geothermal energy in particular and examine its sustainability, environmental impact and some of the associated social and economic issues related to recent industrialisation in Iceland.

Cheap energy, minimum red tape

Iceland, with its vast possibilities of hydroelectric and geothermal energy, became an appealing target for heavy industry corporations such as Alcoa, RioTinto-Alcan and Century Aluminum. In a world increasingly concerned about carbon emissions, the clean image of hydroelectric and geothermal energy is appealing. Though heavy industry processes have an implicitly high environmental impact, they can be made to appear greener by using 'renewable' energy. To this end Iceland was granted an exemption for 'green-powered' industrial emissions under Kyoto, and pollution control schemes are lenient, encouraging industrial investment6.

The wholesale of Iceland's energy resources began in 1995 when the Ministry of Industry and Landsvirkjun, the national power company, published a brochure entitled "Lowest energy prices!!"7. The brochure glorified the country as having the cheapest, most hard working and healthiest labour force in the world, the cleanest air and purest water – as well as the cheapest energy and "a minimum of environmental red tape".

For ten years former Prime Minister Davíd Oddsson (who became the central bank director largely blamed for the collapse of the Icelandic economy) led the campaign to attract energy intensive, and therefore often highly polluting industries. In 1998, Century Aluminum constructed their first smelter in Iceland at Hvalfjordur, to be expanded eight years later. Three to five new aluminium smelters were planned. The existing Alcan (now Rio Tinto) smelter and a steel factory was to be expanded and an anode factory erected. An energy master plan was drawn up to harness the 30 Twh of electricity needed; dozens of dams would be built in every major glacial river, and nearly all geothermal areas would be exploited.

Not everyone agreed with the projects. In 2004, at the third European Social Forum in London, Icelandic environmentalists made an international call for help. That year, the international campaign Saving Iceland was formed to oppose the masterplan8. In consecutive years, four summer action camps were held. A number of years of direct action as well as mainstream protests by celebrities such as Sigur Ros and Björk and Icelandic intellectuals have seen the cancellation of some of the most damaging projects. Still, construction of a number of new dams in rivers Thjorsá and Tungnaá is planned to start this year (2009) to provide power for expansion at Rio Tinto-Alcan's existing smelter, a data centre and a number of silicon refining plants by corporations who's names are kept hidden by Landsvirkjun.

Cheap imported labour

Large dam projects in the majority world have been associated with mass displacements and 'cultural genocide' on an enormous scale9. Comparatively, the social impact of the developments in Iceland is small. Nonetheless cheap energy and labour is just as important to corporations operating in Iceland as elsewhere. Special arrangements are made by governments for subsidised borrowing and tax cuts, loans for expensive dam and geothermal projects are taken by the state-owned power company at the taxpayers risk, while the price paid for energy is kept secret, and depends on world price of aluminium. Thus the taxpayer directly subsidises every ton of aluminium when its market price drops. Imported cheap labour and low workers rights standards are routinely employed on construction sites. More than a dozen Chinese and other foreign workers died in construction of Karahnjukar, and more recently two Romanian workers suffocated in geothermal drill pipes on the site of a work camp near Reykjavik where they sometimes work up to 72 hour a week and shifts of sometimes 17 hours10. Workers are effectively confined to the camps for their 3-5 month work periods, going out to the capital once a month.

'Kuwait of the North'

Now that Icelanders have realised the full impact of Karahnjukar, public opinion is less favourable to large dams, and power companies have shifted their focus to geothermal exploitation. Currently the Hengill area east of Reykjavik is being developed on a large scale for the recently completed expansion of the Century Aluminum smelter in Hvalfjordur. Test drilling is taking place in four fields (Krafla, Bjarnarflag, Theistareykir and Gjastykki) in the north of the country for a new Alcoa smelter near Husavik. Brennisteinsfjöll, Krísuvík and Reykjanes fields, southwest of Reykjavik, are planned to be developed for a new Century smelter. The national power company plans to triple geothermal power capacity to 1500 MW, on top of the 575 MW currently generated by geothermal, of which a large proportion already goes to the two existing smelters in the Reykjavík area. Also, a new public-private consortium has been formed to develop deeper drilling of geothermal fields, which would amplify the scale of geothermal production and power generation potential.11 Ultimately, it is proposed that all of the economically feasible hot spring areas in Iceland will be exploited for industrial use, including a number of sites located in Iceland's central highlands, the beautiful heart of Iceland's undisturbed wilderness12. Landsvirkjun, without any irony, has termed Iceland 'the Kuwait of the North'13 Geothermal promises Geothermal potential with current technology is found at hotspots on the earth's surface, where magma intrudes into the rock bed and heats porous rock to high temperatures14. Electricity is generated by drilling into these reservoirs and powering turbines with high-pressure steam emitted from boreholes. The original geothermal power stations and boreholes supplying domestic needs in Reykjavik are small-scale installations that efficiently provide electricity, hot water, and heat, from sources in close proximity to the city, and are fairly sustainable.

As with any form of energy generation, there are environmental issues with geothermal exploitation that should be taken into account. These impacts are exacerbated significantly by the greater scale and intensity of production that energy-intensive industries require. But the quick-to-embrace enthusiasm for any technological solutions that promise to be a way out of our fossil fuel addiction, have tended to gloss over the downsides of geothermal exploitation and promote its intensive commercial use. Geothermal energy has the image of being sustainable, carbon neutral and of low environmental impact. How does this image compare to reality?

Renewable

Geothermal reservoirs have a sustainable production level if the surface release of heat is balanced by heat and fluid recharge within the underground reservoir15. This happens naturally in undisturbed hot springs, which have remained at more or less constant temperature over hundreds of years, but these recharge rates are generally not sufficient for exploiting

economically16. The Geyser hot springs at Calistoga, USA experienced a 150% decrease in production over ten years, due to rapid exploitation to meet economic requirements, and there have been many similar cases17.

Extracting super heated steam and fluids eventually causes a drop in pressure and temperature of the reservoir. Re-injection of fluids maintains pressure but has a cooling effect and best available technology cannot fully re-inject all extracted fluids, as significant amounts of steam and wastewater is released into the environment18.

Boreholes are usually modelled for only 30 years of production19. Recovery of reservoirs used for commercial energy generation takes 100-250 years before being viable for exploitation again, while in shallow, decentralised heat pump systems used for home heating, recovery time roughly equals production time20. Another problem is that geothermal hotspots like Iceland are seismically active zones. In Iceland, it has occurred that two thirds of boreholes in a field were destroyed by quakes.21 Compared to the geological time scale of oil regeneration, geothermal energy is relatively renewable. However geothermal energy cannot truly be called a renewable energy source and boreholes need to be decommissioned after a few decades.

Carbon-neutral

Geothermal gases are rich in various elements and chemical compounds (such as sulfur). Carbon dioxide is present in quantities reflecting of this chemical make up which is distinct to each area. In Krafla (North Iceland), CO2 makes up 90-98%, the rest being hydrogen sulphide22.
Calculations based on the national power company (Landsvirkjun)'s site study for current North Icelandic geothermal developments reveal that the 400 MW of boreholes planned for a single Alcoa smelter in Húsavík will release 1300 tonnes CO2 per MW23. An average gas powered plant would produce only slightly more, 1595 tonne per MW24. The total of 520,000 tonnes CO2 for these fields alone is almost equivalent to all road transport in Iceland25.
In Iceland, a single site emitting over 30,000 tonnes requires an emissions permit. Conveniently, figures for current geothermal power stations hover just under that figure. Either way, Icelandic authorities do not consider emissions from geothermal plants anthropogenic and do not include them in greenhouse gas inventories, although currently operating plants emit 8-16% of the country's total emissions26.

Minimal environmental impact

Geothermal fluids contain high concentrations of heavy metals and other toxic elements, including radon, arsenic, mercury, ammonia and boron, which are damaging to the freshwater systems into which they are released as waste water. Arsenic concentrations of 0.5 to 4.6 ppm are

found in wastewater released from geothermal power plants; the WHO recommends a maximum 0.01 ppm in drinking water27. Hydrogensulphide (H2S) is a main component of geothermal steam and is responsible for the rotten egg smell of geothermal areas. It is corrosive and classed as very toxic28. H2S is a heavy gas and can linger in valleys, polluting local populations29. It forms sulphurdioxide (SO2) in the atmosphere causing acid rain. Geothermal power accounts for 79% of Iceland's H2S and SO2 emissions30.

In 2004, sulphur pollution in Reykjavik had reached levels regarded as "dangerous"31. In 2008, sulphur pollution from the Hellishei"i power station, 30 km away, was reported to be turning lamposts and jewelry in Reykjavík black. A record number of objections was filed to two more large geothermal plants in the same area, which would have produced more sulphur and carbon emissions than the planned smelter they were supposed to power, and plans were put on hold. In the North the town of Reykahli" will become exposed to 32,000 tons of H2S per year32 if the geothermal power plants (for which feasibility studies are now complete) are built. High levels of sulphur pollution are associated with increased mortality from respiratory diseases33. Landscape impact is another significant factor. Each geothermal borehole drilled only produces a few megawatts of power, and may be located across a large area, connected to the main power station with pipes and roads. Numerous test holes are drilled for every borehole that goes into production. A currently ongoing project, the proposed expansion of Hellishei"i, demands more than 100 boreholes in a stunning area of wilderness, providing 160 MW, less than half of what is needed by the smelter it will power34.

Areas such as Hellishei"i are globally rare, very beautiful and scientifically interesting. Icelandic geothermal areas are characterised by colourful striking landscapes, hot springs, lavas and glaciers, and are biologically and geologically endemic to the country. In the extreme conditions of heat and salt found at each hot spring or cave, extremophiles, unique mosses and bacteria, develop, such as Hveraburst, a heat tolerant moss found only in Iceland's Hverager"i hot spring area. Research into these primeval species is in its infancy, and already has led to greater understanding of the formation of life on earth, and the possibilities of evolution of extraplanetary life. Irreversible disturbance to these wild areas for power plants includes roads, powerlines, heavy lorries and loud drilling equipment. It has also been suggested that depletion of one geothermal reservoir can result in the drying of surrounding hot spring areas35. Thus the direct environmental impact of geothermal extraction may be much larger than previously thought, and landscape is a key consideration.

100% renewable, double the emissions

In conclusion, the impacts from geothermal energy that is developed on a large scale such as is currently happening in Iceland, are greater than generally assumed. As regards climate issues,

Iceland may end up in an extraordinary position. The Icelandic ministry of environment has calculated that if only some of the planned industrial projects continue36, greenhouse gas emissions in 2020 will be 63% higher than in 1990 (assuming that emissions from geothermal and hydro plants are nil)37. If all projects continue and emissions are taken into account, Iceland's climate footprint, powered by 100% 'green' energy could double (again, this figure excludes emissions from geothermal or hydro plants).

This is made possible because the country was not just granted a generous 10% increase under Annex 1 of the Kyoto Protocol, but also took advantage of a specific exemption for emissions of heavy industry powered by 'renewables'.

Iceland has also been mentioned in proposals for a European (or even global) green energy super grid38. The calculations brought forward here suggest that it is not worthwhile to replace gas-powered plants by Icelandic geothermal. If that electricity is to be used for growth of heavy industry, it is quite arbitrary for the climate whether that would be in Iceland or mainland Europe. The aluminium industry is set to increase its emissions by a fifth by 2020 (see Box 1: The aluminium industry, climate and green energy) and this includes its embrace of non-fossil energy.

As an alternative, Landsvirkjun has taken to lobbying data centre corporations, silicon refineries and other energy intensive industries with better public images than Rio Tinto to come to Iceland. If such plans go ahead, Iceland would become a large hard disk for the global Internet. Again, moving gas-powered servers from Europe to geothermal-powered servers in Iceland does not significantly decrease emissions.

And there is another reason not to embrace these projects. Wilderness areas are becoming rare globally, with over 83% of the earth's landmass directly affected by humans39, and the Icelandic wilderness is one of the largest left in Europe. It provides important regulating ecosystem services and has aesthetic, scientific, medical, cultural and spiritual significance for humans. However, we believe all landscapes, ecological systems and forms of life have their own intrinsic value and right to develop for themselves, rather than for the sole benefit of mankind. We believe the dominant world-view that sees the natural world as a collection of 'resources' has greatly contributed to severe ecological and social crises. To recover from the consumption paradigm we must redefine our environmental ethic and what it means to be human, to include a profound sense of the fragile and beautiful interconnection of life on earth.

Proponents of heavy industry in Iceland have stated that it is the country's 'ethical obligation' to sacrifice the country's wild areas for the sake of the environment40. While this is more likely than not moral opportunism on the side of those who are to benefit from the projects, the

technological or pragmatic environmentalism in favour of super grids and mega data centres comes down to a proposal to sacrifice unique ecological areas for the of greater good of living a resource-intensive i-life style 'sustainably'. In contrast, for anyone who identifies with a natural area, it is easy to understand why it has a value of it's own. Given the rarity of wild lands in this context, the value can be seen as far greater than that of any of our possessions; it is in a sense, invaluable.

What can perhaps be concluded from this Icelandic green energy case study, is that application of a technology that has been thought of as renewable, climate-friendly and low-impact, on the large scale that is associated with fossil fuels, makes it a lot like the technology it was supposed to replace. It has certainly been argued that technological systems tend to reproduce themselves independent of the specific technologies41 42. Simply applying a different technology to address issues that are not entirely technological, is not addressing the problem of our over consumptive lifestyles. But it can end the existence of a place that is not like any other, irrevocably.

The aluminium industry is the world's most energy–intensive industry, and also one of the most polluting43. Aluminium is derived from bauxite soils, mainly found in the tropics and subtropics. Five tonnes of bauxite is strip mined to produce one tonne of aluminium. Large scale deforestation of tropical forests caused by shallow open cast mining creates soil erosion and water pollution and has displaced and destroyed the livelihood of numerous indigenous peoples in Australia, India, Brazil and elsewhere, a process which continues to this day44 45. Bauxite is refined to produce alumina and leave red mud, a caustic mixture of heavy metals and radionuclides, which is known to cause silicosis, cancer, and other diseases associated with radiation46.

Alumina is smelted using carbon anodes and aluminium fluoride to remove the strongly bonded oxygen. This part of the process is most energy intensive and produces inorganic fluorides, SO2, CO2 and perfluorocarbons (very strong greenhouse agents) in the airborne waste, as well as solid spent pot linings containing cyanides and fluorides. Approximately 30% of aluminium is used for arms production and defence; the remainder is used for cars, planes and construction, packaging and disposables47 48.

Cradle to grave

Metal giants have not enjoyed a particularly good environmental reputation. Rio Tinto was described by motion in the British parliament in 1997 as "the most uncaring and ruthless company in the world", for human rights, anti-unionising and total disregard for indigenous people49, and was pulled up again in 2000, for war crimes, environmental destruction and

racism50. Recently the corporation was thrown out of the Norwegian Government pension fund for similar reasons51.

Century Aluminum's Icelandic smelter has been accused of forcing injured workers back to work52 and of producing illegal amounts of fluorine pollution causing health problems53. The company is working with the Sassou government of Congo- Brazzaville, a single-party regime which came to power in fraudulent elections in 2002, to develop large scale open cast bauxite mining54 55. It's bauxite mining and refining in Jamaica has been responsible for large-scale rainforest destruction and water pollution56 57 58. Alcoa has been convicted numerous times for toxic waste dumping in the US59, old-growth and rainforest destruction and displacement of indigenous people in countries such as Brazil, Suriname and Australia60 61 62. Alcoa has lost popularity in Iceland for its intimate association with the US military, which is categorically denied by Alcoa Iceland (although it has a website dedicated to it's military products)63. In Honduras, an Alcoa car parts factory was accused of treating workers worse than sweatshops. The basic pay of 74 cents an hour covered 37% of an average family's most essential needs, and in the last three years, wages fell by 13%. Workers would be forced to urinate and defecate in their clothes after being repeatedly denied to use the bathroom and women would have to take off clothes to prove they were menstruating. Protests by workers in 2007 led to 90% of the trade union leaders being fired64.

Nonetheless, Alcoa claims to be one of the worlds most ethical and sustainable companies, according to a host of international awards listed by the company65. Their website (subtitled 'Eco-Alcoa' – 'Click here to see how Alcoa is part of the solution') is dominated by articles on community projects and energy saving initiatives, and with former Greenpeace and WWF directors at the helm, they are doing well to promote a green image. In a recent presentation, Alcoa state they are on the cutting edge of green corporate thinking, embracing recycling and green energy and even claiming to be carbon-neutral, as a whole industry, by 202066. Are these promises coming true?

Recycling

Recyclability of aluminium is probably the most important selling point for the industry: "It's more like reincarnation than recycling"67. Recycling aluminium is indeed 95% more efficient than primary production; still, it takes the same amount of energy as producing new steel68. Alcoa sources only 20% of its aluminium from recycling. Overall recycling rates are 33% and, according to US Aluminium Association figures, going down69 70.

Renewable energies

The aluminium industry has long been closely tied to the hydro-industry71 and over half of smelting is hydro-powered72. Due to the low economic return per energy unit, smelting is increasingly geared towards countries with low energy and labour costs73 74 whether hydro (e.g. Brazil, Congo, Iceland, Greenland), natural gas (Trinidad, Congo-Brazzaville) or coal (South Africa, India). Indirect greenhouse gas production from dams and geothermal power stations are not included in the industry's audits.

Reducing greenhouse gas emissions

Aluminium production accounts for ca. 1% of global greenhouse gas emissions, producing 13.1 tons of CO2 equivalent per ton of aluminium75. Technological advances have led to 20-25% emissions savings in the smelting process in recent decades but overall emissions are increasing and there is no concrete intention to reduce them. In fact, Alcoa predicts a 20% increase of CO2e emitted per year from ca. 335 million tonnes of CO2e in 2000 to ca. 400 million tonnes in 202076 (see figure).

Figure 1. Projection of greenhouse gas production by the aluminium industry (Adapted from Overbey, 200577)

Carbon neutral

However, Alcoa states that around that time, cars will contain more aluminium, be lighter and thus save fuel. This saves carbon emissions, and in 2017, the amount saved will be roughly the same as the increase in emissions by the aluminium industry. Thus, the industry can be carbon neutral whilst producing 20% more greenhouse gases. The fallacy of this reasoning is easy to see: imagine we would drive even more and in larger vehicles than Alcoa is projecting. In that case the industry would be carbon neutral even earlier: if I buy an aluminium hummer, I save more than when I buy an aluminium fiesta. Even if crediting would work that way, Alcoa assumes the aluminium industry get all the credits, not the car manufacturer or consumer.
The aluminium industry, like all mining industries, has a severe environmental impact and a consistent record of human rights violations. Because the industry is in all aspects 'part of the problem', it is vitally important for corporations such as Alcoa, to join the green bandwagon and proclaim 'it is part of the solution'. However, ecologically responsible primary aluminium production is not a reality. If Iceland is the model for green heavy industry, one must question whether that is possible at all.

In times of economic crisis, it is tempting to embrace new megaprojects such as new power plants and aluminium smelters. But will this realistically improve Iceland's economic prospects? Prime minister Geir Haarde recently explained on Stöd 2's chat show Mannamál that one of the main reasons for the fall of the Krona, was due to the execution of heavy industry projects: the construction of Kárahnjúkar and Alcoa's smelter in Rey"arfjör"ur. If more large projects are executed, what will the cost be for the Icelandic taxpayer?

Haarde's comments were not surprising. Before construction of Kárahnjúkar many economists predicted the negative impact on inflation, foreign debt and the exchange rate of the ISK. Of course there is some economic benefit from new smelters, but "it is probably outweighed by the developments' indirect impact on demand, inflation, interest rates and the ISK exchange rate," stated a report by Glitnir in 2006 on the impact of aluminium expansion in Iceland. The report expected an increase in inflation and a depreciation of the ISK.

"Kárahnjúkar will never make a profit, and the Icelandic taxpayer may well end up subsidising Alcoa," said the eminent economist Thorsteinn Siglaugsson after publishing another report on the profitability of the Alcoa dam in East Iceland before construction commenced.

How did the Fjardaal smelter contribute to Iceland's economic crisis? The two billion dollars for the construction of the country's largest dam had to be borrowed by the state. That led to a more than significant increase in the current account deficit, which is now felt in increased inflation and depreciation of the currency. The economic cost now needs to be coughed up.

Note that any schemes that demand new power plants associated with a significant amount of borrowed capital will have this effect, whether an expensive dam or power plant is meant for aluminium, a silicon refinery, data centre or some other purpose. It is quite simple. If you borrow money, you will have to pay back in one-way or the other.

Of course, once they are built, smelters bring in some degree of income to the country and, so it is argued, there are local economic benefits from a new smelter. Smelters provide jobs. What has hardly been researched in Iceland, though, is how much these new jobs displace jobs in existing local industries.

Local industries around Rey"arfjör"ur have had to shut down as a consequence of employment competition from the smelter. Many new houses that were built are empty. Between 2002-2008, on average 73 more people moved each year from the Eastfjords to the southwest than the other way round. The smelter still depends on many foreign workers. Local communities where large projects such as Fjardaal get constructed become completely dependent on foreign investment, an undesired and unsustainable condition that destroys local resilience.

There is another reason not to construct more smelters in Iceland. The price that the aluminium giants pay for energy to Landsvirkjun is linked to the world price of aluminium. If supply is increased this will lower the price of aluminium, decreasing revenue for Iceland. One might think that a few hundred thousand tons of aluminium more or less will not impact the global market. The reality is that it is not the sum of production that determines the price but rather the friction between supply and demand. A small amount of difference can have a significant effect in terms of pricing. Demand for aluminium is already slumping in the US and Europe. It will too in China when growth slows down there, which is likely to happen before Alcoa's and Century's planned new smelters could come online, considering the world economic outlook.

The metal corporations compete between themselves. Because of this is not just the global price that determines their profitability. The bottom line is eventually determined by how cheaply they can produce. For aluminium, profitability is fundamentally determined by one thing: energy costs. In Iceland, energy prices are rock bottom – the lowest in the world. It is not a coincidence that as Alcoa's Fjardaal smelter went online, 400 workers in Rockdale, Texas were laid off as smelter operations there closed down. In the US, Alcoa pays much more for power.

This is why Alcoa, Century, Rio Tinto and Norsk Hydro all want new smelters in Iceland and in third world countries with cheap energy such as Trinidad and the Congo. When demand slumps, expensive plants can then be shut down in favour of cheap ones such as the proposed smelters at Husavik and Bakki. As inflation stays high and energy revenues low, the Icelandic taxpayer pays the price.

Construction of new power plants, smelters or other large scale projects will have some short term economic benefit as funds are infused into the economy. But, as Geir Haarde recently confirmed, after execution comes the economic backlash. These megaprojects in a small economy have been compared to a 'heroin addiction'. Short- term 'shots' lead to a long-term collapse. The choice is between a short-term infuse or long-term sustainable economic development.

The 'shot' of Fjardaal overheated the Icelandic economy. What was called the 'Kárahnjúkar problem' led to an all time high in the value of the Krona, hurting export and the fish industry in particular. With the all-powerful currency, banks overplayed their hand and went into a spending spree. Drugs make you lose sight of reality.

There has been a lot of critique on the proposed plans to develop Iceland's unique energy resources. Those in favour of it have generally argued that it is good for the economy. Anyone who gives it a moment of thought can conclude that that is a myth. Supposed economic benefits

from new power plants and industrial plants need to be assessed and discussed critically and realistically. Iceland is coming down from a high. Will it have another shot, or a cold turkey?

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Appendix O

Barriers to Geothermal Development

Dan Jennejohn
Research Associate, GEA
July 11, 2011

Barriers to Geothermal

- Geothermal project lead-times can take 4-8 years, or more, before a plant is brought online and projects face obstacles at key points throughout development

- Geothermal expansion faces obstacles in areas of:
  - Exploration and Drilling Technology
  - Project Finance
  - Project leasing and Permitting
  - Transmission
  - Workforce Development

Exploration and Drilling

- Exploration technology and techniques still maturing
  - **Most geothermal resources still "undiscovered" according to USGS**
  - **Pre-drilling exploration techniques rarely provide an unambiguous drilling target (≤50% drilling success rate)**
    - Drilling makes up nearly half of project costs
    - Successful drilling results are needed to secure financing
  - **Exploration technologies adapted from oil and gas sectors do not yield the same rates of success in geothermal exploration**
    - Increased research needed in geothermal exploration technologies
  - **Geothermal exploration and drilling have high risk profiles**
    - THEN: Exploration and drilling by large oil and resource companies who understand natural resources , have suitable risk tolerance and deep pockets
    - NOW: Geothermal industry is dominated by smaller companies with limited access to capital and are, therefore, more vulnerable to risk

Project Financing

- Resource risk still the biggest barrier to entry, very difficult to find commercial financing at this stage
  - **High up-front costs (exploration and drilling can account for nearly 50% of project costs)**
  - **High up-front risks (≤50% success rate for initial production well)**
- Significant equity financing (at least $15M) is required to prove a project's feasibility
  - **Seed capital: typically too little to support drilling**
  - **Venture capital: virtually non-existent for geothermal because of unacceptably high initial resource risk and a lack of understanding**
  - **Equity financing: available, but comes at a high price**
- Project returns may not be high enough to justify risk?
  - **Begs the question: Is geothermal energy properly valued relative to other energy sources?**

Project Financing Continued

- Project returns high enough to justify risk? Lead-time?
  - **Lenders seek return in 2-3 years, geothermal projects taking 4-8**
  - **Economic contraction made investors more risk adverse**
    - Before 2008: funding provided on the basis of ~25% of resource available at the wellhead
    - Since 2008: funding now requires 75 - 100% of resource available at the wellhead
    - Economic contraction reduced the number of entities seeking tax relief and banks providing tax equity financing
  - **Incentives often received at end of long development process**

Leasing and Permitting: Recent Successes

- Federal and state agencies have made significant progress in reducing lease processing delays
  - **Prior to the PEIS in 2008 lease processing took 2 – 3 years**
    - PEIS shortened the review process
      - ~230 of 271 leases offered between fall 2008 – fall 2010 were fully processed!
      - Process shortened to 9 months in states well versed in geothermal permitting
  - **BLM staff shortages and lack of geothermal experience addressed**
    - 2008, BLM Nevada Office worked closely with industry to expedite lease processing
    - Staff additions and EPAct revenue sharing helped to reduce lease processing delays
  - **Projects fare better in states where agencies are familiar with geothermal**

Leasing and Permitting: More Work to be Done

- Permitting Still Delaying Projects
  - **Approval of the Operations Plan (i.e. drilling of production/injection wells) and the Utilization Plan (i.e. plant construction) takes 0.5 to 1.5 years each**
  - **A variety of issues can delay or even stall projects indefinitely**
    - Cultural resources
    - Water rights
    - Wildlife habitat
    - Land acquisition
- Permitting Delays impact project financing
  - **Increases in project lead-time significantly increases project cost**
  - **Permitting must be entirely complete prior to obtaining construction financing**

Transmission

- Access to transmission is a critical barrier to project development
- Major geothermal "reserves" of at least 2000-3000 MW identified in CA are undeveloped due to lack of transmission access to CA markets!
- Build on recent successes: One Nevada Transmission Line (ON Line)Resources in Northern Nevada will finally serve Southern Nevada due to the new 500 mile, 500kv
- Continued support for transmission financing mechanisms through loan guarantees, bonds is needed
- Continued regional planning and interstate coordination (i.e. WECC) also necessary

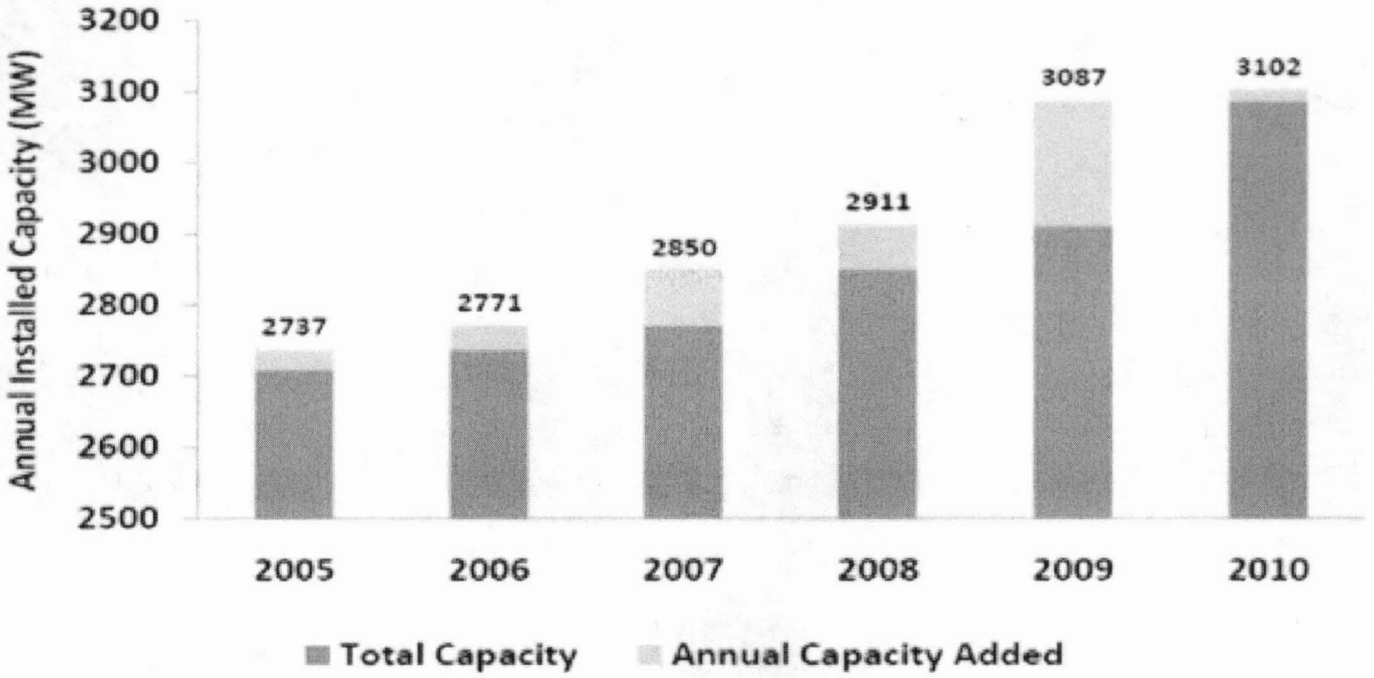
Workforce Development/ Education

- Rapid expansion of geothermal will require an expanding workforce, but...
  - **Current workforce is aging**
    - Similar issue to oil & gas – majority of skilled labor is over the age of 40
  - **Competition with oil & gas for an already small pool of graduates in areas of engineering and geosciences**
  - **Professionals have to be adapted from other industries (i.e. mining and oil and gas) to geothermal**
- Geothermal is labor intensive and industry is working to meet demand
  - **National Geothermal Academy**
    - 8 week intensive course held annually
    - Continued federal funding?

Still Moving Forward

- In spite of barriers industry still bringing power plants online

Figure 8: Total Installed Capacity 2005-2010



Thank You!

GEA

GEOTHERMAL ENERGY ASSOCIATION

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Dan Jennejohn
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Appendix P

The Economic, Environmental, and Social Benefits of Geothermal Use in Hawaii

Liz Battocletti,
Bob Lawrence & Associates, Inc.
June 2006

Geothermal heat or water has been used in the Aloha State for centuries. Missionaries exploring Hawaii in the early 1800s witnessed the Native Hawaiians soaking in the warm springs. Today, naturally occurring steam vents and warm ponds are used for recreational and agricultural purposes.

Due to the state's geology, cracks in the earth in volcanically active areas allow steam to rise to the surface through vents. Some people stick coils of copper pipe into these "wild" steam vents to heat water. Others relax and rejuvenate in the many natural warm ponds located along the Puna coast.

Despite the wealth of geothermal resources, however, few small businesses directly use geothermal heat or water in Hawaii. The Kapoho Kai Nursery in Pahoa has built a small greenhouse over a steam vent. The steam heats the greenhouse, encouraging the landscaping palms to germinate. According to the owner, an added bonus is the steam's slight sulphur content which discourages the growth of unwanted pests.

Steam vents along the Sulphur Banks Trail near the Kilauea Visitor Center (Photo: U.S. Department of the Interior)

The 27-acre Steam Vent Mission in the Kingdom of Heaven, formerly known as the Steam Vent Inn and Health Retreat, contains more than 150 active steam vents. "A natural wonderland in tropical paradise" invites guests to "relax, rejuvenate, and heal in Hawaii's only lava-heated steam saunas and adjacent geothermal bathing pools."

The largest use of geothermal in Hawaii is electricity generation. Located about 21 miles south of Hilo on the Big Island of Hawaii, the Puna Geothermal Venture (PGV) has produced electricity from geothermal resources since April 1993.

PGV has an installed capacity of 30 megawatts (MW), and sells about 212 million kilowatt hours (kWh) per year to Hawaii Electric Light Company (HELCO). The geothermal plant supplies about 20 percent of the Big Island of Hawaii's total electricity demand.

Economic benefits

PGV benefits Hawaii's economy in many ways. It creates jobs. With an annual payroll of more than $3.8 million, PGV provides well-paying full-time jobs to about 30 people. Using a standard multiplier of 2.5, the geothermal plant creates 75 direct, indirect, and induced jobs in Hawaii.

In addition to job creation, PGV contributes to Hawaii's economy through local, state, and federal taxes, and royalties. The plant pays more than $2.5 million a year in taxes and royalties. In 2005, it paid $969,980 in royalties—50 percent goes to the state, 30 percent to the county, and 20 percent to the Office of Hawaiian Affairs.

Over the 13 years PGV has been generating electricity, the plant has paid about $50 million in payroll, and $32.5 million in taxes and royalties.

Last but not least, geothermal energy reduces the demand for imported oil, helping to stabilize the cost of electricity.

Imported petroleum currently supplies about 90 percent of the state's energy. In 2004, utilities spent $524.2 million on fuel for electricity production, passing the cost on to the customer, who in turn paid $1.656 billion for electricity.

Using indigenous geothermal resources, PGV has reduced the need to import more than 5 million barrels of oil since 1993. Using the average price per barrel from 2000 through 2005 of $26.78, PGV has resulted in an estimated cost savings of $144.6 million from 1993 to the present.

According to the Energy Resources Coordinator's 2004 Annual Report, "Every barrel of oil saved translates to more dollars available to the local economy, in addition to the many environmental benefits."

Environmental benefits

In addition to jobs, taxes, royalties, and reducing Hawaii's reliance on imported fuel, PGV prevents the emissions of greenhouse gases (GHG) and air pollutants. Since 1993, the Puna geothermal power plant has offset roughly 2.5 million tons of carbon dioxide emissions that would have been generated by a similar-sized fossil fuel plant. This is equivalent to 5.4 million barrels of oil. In addition, the plant annually offsets the emission of 1,328 tons of nitrogen oxides and 983 tons of sulfur dioxides (see Table 1).

In comparison, as a whole, Hawaii's electric industry emitted 29,000 tons of sulfur dioxide; 15,000 tons of nitrogen oxides; and 9 million tons of carbon dioxide in 2002. The annual GHG emissions are equivalent to burning 19 million barrels of oil.

The PGV geothermal plant also eliminates the need to ship fuel oil from the refineries on Oahu, reducing the risk of oil spills.

Social benefits

Social benefits are difficult to measure quantitatively. The Energy Resources Coordinator's 2004 Annual Report stresses energy's relevance to standard of living, a contributor to social well-being. The report notes that "Energy continues to be a key factor shaping Hawaii's economy, environment, and standard of living. A stable energy supply is essential to continued prosperity."

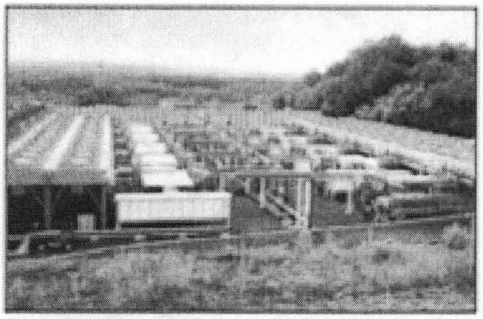
The use of indigenous energy resources, such as geothermal, results in predictable long-term electricity rates, and ensures that fewer dollars leave the state to purchase fuel and are instead available for other purposes within the islands' economy. A strong local economy includes a vibrant visitor industry: the Department of Business, Economic Development and Tourism (DBEDT) projects that Hawaii expects to host 7.7 million visitors spending 70,000 days and $12.4 billion in 2006.

The Future

Hawaii is rich with low- and medium-temperature geothermal resources which could be developed into thriving small businesses. Geothermal heat or water, including the waste heat from the Puna geothermal plant, could be used to dry fruit; provide cold storage or refrigeration; grow fish or other aquatic species; heat greenhouses; process agricultural goods, e.g., lumber, macadamia nuts, and animal feed; pasteurize or sterilize; and pamper guests in spas and resorts.

PGV has received permits to double its installed capacity to 60 MW. Doing so would likely also double the significant economic and environmental contributions it makes to Hawaii.

In addition, the State is exploring producing hydrogen via electrolysis using geothermal.



Puna Geothermal Venture, Pahoa, Hawaii (Photo: Ormat)

The potential for geothermal to contribute to Hawaii economically, environmentally, and socially—even more than it already does—is substantial.

				Annual Emissions Offset (tons)				
Name	**Location, County**	**Installed Capacity MWe**	**Annual Energy produced kWh**	**Nitrogen oxides**	**Sulfur dioxide**	**Carbon dioxide**	**Years online**	**Total Carbon dioxide offset (tons)**
Puna Geothermal Venture	Pahoa, Hawaii	30	212,060,000	1,328	983	196,812	13	2,559,552

Table 1 — Annual greenhouse gas and air pollutant emissions offset by Puna Geothermal Venture.

William P. Kenoi
Mayor

William T. Takaba
Managing Director

Walter K.M. Lau
Deputy Managing Director

County of Hawai'i
Office of the Mayor

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January 3, 2012

MEDIA RELEASE: FOR IMMEDIATE RELEASE
Contact: Desiree M. Cruz, Public Relations Specialist 961-8507

Geothermal Working Group- Final Report unveiled by the County of Hawai'i

(Hilo, HI) The Geothermal Working Group, with the support of Hawai`i County Mayor Billy Kenoi, will present the final draft of the Geothermal Working Group Report on Wednesday, January 4, 2011 at 2:30 p.m. The press conference will be held at the County building on the Mayor's lanai at 25 Aupuni St., second floor.

The report was sponsored by the County of Hawai'i to evaluate geothermal energy as the primary source of baseload power for electricity on the Island of Hawai'i. The report includes an analysis of technical data and expert testimony providing convincing rationale to develop local renewable energy plants and transition away from the county's dependence on petroleum-fueled generators for baseload electricity. The report, which is currently being circulated within Hawai`i's State Legislation, was developed as research to help support Hawai`i's Clean Energy Initiative goals.

Geothermal Working Group Co-Chair Wally Ishibashi, will present the report in detail, with supportive comments presented by Mayor Kenoi. Geothermal Working Group Co-Chair Richard Ha will discuss the important issues surrounding peak oil and its relevance to Hawai`i Island. Ha recently traveled to Iceland where he observed how the country recovered from the biggest financial crash in modern history. Ha stated, "They are recovering because they inoculated themselves from high oil prices by using low cost hydro and geothermal for 100 percent of their electricity and house heating. It is clear to me that had they used expensive biofuel to generate electricity, they would not be competitive in making aluminum for export. And instead of coming out of this disastrous financial situation, they would be facing years of depression. This is exactly why Hawai'i should not be using expensive biofuels to make electricity when we have low-cost geothermal."

Ha was also sponsored by the County of Hawai'i to attend this year's Association for the Study of Peak Oil Conference, which took place this past October in Washington, DC, and will present his findings at the press conference.

For a full copy of the Geothermal Energy Working Group - Interim Report, please go to

http://www.hawaiicounty.gov/research-and-development

####

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

County of Hawai'i
Office of the Mayor

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Geothermal Energy Working Group
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

Wednesday, June 2, 2010
Office of the Mayor

CALL TO ORDER

The inaugural meeting was called to order by Co-Chairman Richard Ha at 3:10 p.m. Co-Chairman Ha introduced Mayor Billy Kenoi.

PRESENT:

Carlito Caliboso
Richard Ha, Co-Chairman
Nelson Ho
Jacqui Hoover
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Ted Peck

GUEST SPEAKERS
Jose Dizon, HELCO
Mike Kaleikini, Puna Geothermal Venture
Mayor Billy Kenoi
Council Member Emily Naeole-Beason

Mayor Kenoi thanked everyone for their support of the newly formed Geothermal Energy Working Group. He acknowledged the presence of Councilwoman Emily Naeole-Beason.

Mayor Kenoi stated that everyone recognizes that energy and its cost moving forward determine the quality of life for island residents. It is essential to address the importance of renewable and alternative energy development. He explained that the Hawai'i Clean Energy Initiative aims to have the State obtain 70 percent of its energy from renewable energy sources by 2030. If there is any community that will achieve that goal, it is the County of Hawai'i, because it is already at 32 percent.

Mayor Kenoi stated that in order to accomplish this goal it is necessary to maximize the availability and the opportunity that surrounds geothermal. Senate Concurrent Resolution 99 (SCR 99) directs Hawai'i County to establish a working group to analyze the potential development of geothermal energy making it cost effective and feasible. The Geothermal Working Group will consider the expansion of geothermal development and address its impact on the environment and its culture.

Mayor Kenoi stated that he feels confident that the members selected consist of talented individuals who will make significant and substantial strives in expanding and utilizing the "gift of geothermal."

Councilwoman Naeole-Beason offered a short prayer to spiritually guide the members in wisdom, knowledge, and understanding.

Councilwoman Naeole-Beason commented that she witnessed the process of geothermal and how it has evolved throughout the years. She supports the newly formed group and looks forward to the county providing new sites for geothermal. As a result of Puna geothermal, she is presently the only councilmember on Hawai'i Island who is capable of utilizing royalty funds to take care of her district. She hopes that in the future other Council districts will be able to benefit from geothermal.

Co-Chair Ha thanked everyone for supporting the newly formed Geothermal Energy Working Group. He explained that this working group will need to file an interim report with the Legislature prior to the start of its 2011 session. In the next seven months, the group is directed by SCR 99 to analyze the potential development of geothermal energy as the primary energy source that can meet the base load demand for electricity on the Big Island.

As a farmer, Co-Chair Ha stated that in the past he attended several seminars. He learned about the concept of energy return on investment, and the standards of rural oil supplies. Studies indicate that the end of cheap oil is near. Individuals who are less fortunate financially will be the most vulnerable. Co-Chair Ha explained that according to HELCO's website, geothermal energy costs approximately 11 cents per kilowatt hour for base power. Based on this figure, it is by far the cheapest form of base power. Geothermal is proven technology: it's cheap, it's a gift to use wisely, and it can be shared with future generations. Also, there are future possibilities to develop with geothermal including transportation, fertilizer, ammonia, etc.

Representing the Big Island Labor Alliance, Co-Chairman Wallace Ishibashi explained that in the 1980's he was a member of the first geothermal group called the Hawai'i Island Geothermal Alliance (HIGA). At that time, it was a touchy subject, however; over the course of time the first phase of geothermal has proven to be very effective, clean, and beneficial to Hawai'i island. Mr. Ishibashi said that he continues to take interest in the development of geothermal because "it is the right thing to do Geothermal energy is available in only certain regions of the world and Hawai'i Island is blessed to have this resource."

Co-Chair Ishibashi stated that the Hawaiian community may possibly have concerns regarding this issue. It is the Geothermal Energy Working Group's responsibility to address them openly with understanding and aloha. He said, "the fact is Pele is recognized as a living goddess to some Hawaiians in the community. It is important to acknowledge the communities issues with respect and understanding of their culture."

In order for geothermal to succeed, Co-Chair Ishibashi commented that the key is for businesses and the working class to see a difference in their electric bill. Once businesses receive savings, they can than afford to provide better wages to their workers. He also commented that many people believe that there is a price to pay in order to live in Hawai'i. Co-Chair Ishibashi stated that that way of thinking must change. The fact is that cheaper energy attracts better business opportunities for our islands. Geothermal will reduce the cost to Hawai'i residents and business operators. Therefore, the goal is to attract better business in Hawai'i because this cheap base energy will allow affordable living.

Co-Chair Ha asked that all members introduce themselves.

Patrick Kahawaiolaa introduced himself as the current president of the Native Hawaiian Community on Hawaiian Homelands. As a representative of the native Hawaiian community he would like to move forward with geothermal becoming a meaningful resource.

Nelson Ho introduced himself and stated that he got involved with geothermal energy in 1981. That is when 500 megawatts was proposed adjacent and upwind of Hawai'i Volcanoes National Park. He is interested in learning what new developments have transpired. In the past, some of the original concerns raised involved the demand. Those issues involved the cost of bringing in a new supply of energy, the efficiency and usage, and whether the environmental and cultural subsidies were sufficient in making geothermal economical as an energy resource.

Mr. Ho explained that there were a lot of constraints on geothermal energy. Those constraints are on the record and are historical. He would like to see if any of these issues have changed throughout the years. Also, he would like to know what the Public Utilities Commission's views are regarding this resource becoming the base load energy.

Jacqui Hoover introduced herself as a representative of West Hawai'i, she is involved with the Hawai'i Leeward Planning Conference and the Hawai'i Economic Development Board. She was born and raised on Hawai'i Island. Thereafter, she attended school in California. Ms. Hoover mentioned that she was involved with the early geothermal efforts in California and would like to see what opportunities exist in order to stabilize energy use on Hawai'i Island.

Carl Caliboso introduced himself as chairman of the Public Utilities Commission. He explained that the PUC's role is to regulate public utilities. In this case, this regulation will be directed towards HELCO. He personally encourages HELCO to consider and explore existing alternative energy sources like geothermal. The consideration of expanding geothermal is very interesting. The PUC has an interest in making sure that utility service provided to the community is reliable and offers reasonable rates to the consumer. Sometimes it is necessary to make an investment in a short term to have long term benefits. This is seen a lot with other renewable energy type options and investments that are being considered and proposed. Mr. Caliboso remarked that it is also important to be sensitive to many different concerns that are deeply rooted because that is why this taskforce was established.

Jose Dizon introduced himself as the general manager for operations at HELCO. He participated at the First Natures' Futures program symposium on Friday. At that symposium, he spoke about the challenges in Hawai'i involving social, cultural, and historical issues. Although there are many issues involved, Mr. Dizon stated that he does believe there is a way to make it work.

Barry Mizuno introduced himself as a representative of the Hawai'i Economic Development Board. He disclosed that he worked for Puna Geothermal Venture and retired in 2006. At the present time, he works as a consultant for them. He stated that there are many experts that have indicated that there will be a $200 barrel of oil increase within the next 18 months. "This is scary, whether it is true or not." Hawai'i is 90 percent reliable on fossil fuel, and it is important to seriously consider other options immediately to plan for the future.

Ted Peck introduced himself as the energy administrator for the Hawai'i State Energy Office. He was also on the panel on Friday. He stated that his heart was wounded when he heard the stories of when geothermal was first introduced, and the insensitive and inappropriate way that it was put forth. As a State and as a Nation there have been many wrong doings. However, we are now on the door step of a different kind of oppression and we have an opportunity to free ourselves from that oppression. Geothermal energy working for the community, the county, and culture can have a role with future possibilities such as transportation. Mr. Peck stated that he is honored to be a part of this taskforce and looks forward to exploring this matter further.

Co-Chair Ha stated that Hawai'i can become comparatively advantageous to the rest of the world. Geothermal will elevate our economy and community to a higher place.

HELCO Presentation – Big Island Energy Overview
Presentation provided by HELCO General Manager Jose Dizon
(See Attachment A)

PGV Presentation – Geothermal Energy in Hawai'i
Presentation provided by PGV General Manager Mike Kaleikini
(See Attachment B)

Co-Chair Ha requested that someone volunteer to collect data for the cost benefit analysis report.

Mr. Mizuno stated that the report provided to the group on Assessment of Energy Reserves and Costs of Geothermal Resources in Hawai'i was created by the State of Hawai'i Department of Business, Economic Development and Tourism (DBEDT) on September 30, 2005. He asked that the members review the executive summary identifying the five geothermal rift zones on the Big Island. All five of the combined resource areas have a minimum megawatt of 488 and a combined megawatt of approximately 1396. Since the report is dated from 2005, Mr. Mizuno commented that it is necessary to receive a current projection.

Mr. Peck advised that action will be taken to discuss that matter with DLNR.

Ms. Hoover informed the group that although the report is dated in 2005, the data was collected in 2000.

Mr. Peck's assistant interjected and stated that there is no current study.

Mr. Ho recommended that a representative from DLNR attend future meetings because they designate where geothermal occurs.

Mr. Peck volunteered to meet with DLNR and provide a report at the next meeting.

ASSIGNMENT OF COMMITTEES

- Committee on Feasibility and Cost-Benefit Analysis
  - Ted Peck and Jacqui Hoover will provide a report.

- Committee on Potential Impacts of Geothermal Energy Production Expansion
  - Nelson Ho and Patrick Kahawaiolaa will provide a report.

- Committee on Electricity Transmission System Improvements and Funding.
  - Jose Dizon will provide a report.

- Committee on government accounting and community benefits packages of royalty distributions.
  - Barry Mizuno will provide a report.

FUTURE MEETINGS

The members agreed on the following:

- Tour of HELCO and PGV facilities.
- Meetings will be arranged monthly with the help of the County.
- Meetings will be open to the public.
- Meetings will be two hours.

UPCOMING AGENDA ITEMS

- Geothermal future possibilities regarding hydrogen and ammonia.

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Transcriber

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

Thursday, July 15, 2010
Hamakua Conference Room

CALL TO ORDER

The meeting was called to order by Co-Chairman's Richard Ha and Wallace Ishibashi at 2:10 p.m. Appreciation was offered to Jay Ignacio and Jose Dizon for allowing the Geothermal Energy Working Group to tour the HELCO plant prior to the meeting.

PRESENT:

Carlito Caliboso
Andrea Gill
Richard Ha, Co-Chairman
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Robert Lindsey

GUEST SPEAKERS:

Donald Thomas, Center for the Study of Active Volcanoes
Kanoe Wilson, First Nations' Futures Program

A question was raised regarding the recent power outage on the Big Island.

Jay Ignacio explained that there was a series of generators that tripped off-line. There was approximately a 50 percent power loss on the island which resulted in a large imbalance of power. When this type of incident occurs, an Automatic under Frequency Load Shed system automatically disconnects customers in order to correct the

imbalance. This systems capability allows HELCO to control the system remotely, reestablishes the imbalance in power, and quickly restores service to customers.

GUEST SPEAKERS

Hawai'i's Geothermal Resources an Overview and History Powerpoint Presentation provided by Donald Thomas. (See Attachment "A")

Mr. Thomas explained how the island chain was formed and how all islands were derived from a planetary process called a "mantle plume." This process has been generating magma for the past 80 million years. This ultimate heat source floors Hawai'i's volcanism and it has been a long standing process. Presently, the Big Island happens to be located over the mantle plume. Kilauea volcano is over the "hotspot" and is recognized as one of the highest areas for geothermal potential. He pointed out that Kilauea actually has two rift zonesthe east rift zone and the southwest rift zone. The enormous size of the east rift zone compared to the southwest rift zone is clear evidence that much more lava has erupted from the east rift zone.

Mr. Thomas identified Hawai'i island's volcanoes and provided the members with a brief history on their location, age, activity, and subzone locations for potential geothermal energy.

Mr. Thomas mentioned that a Geothermal Technical Advisory Committee was formed in the past. Those members collected data in order to identify geological sites for geothermal. The committee became inactive and stopped meeting.
At this time, there is consideration to reactivate the committee so that they can gather additional information and reevaluate the original data. In his opinion, Mr. Thomas stated that although work conducted in the 70's and 80's were sufficient, it is necessary to obtain a geophysical survey at this time.

If an update is conducted every five years, Co-Chairman Ishibashi inquired on when was the most recent.

Mr. Thomas answered that the last update was in 2005.

Ms. Andrea Gill commented that geophysical surveys were not done at that time.

Co-Chairman Ishibashi inquired on whether the committee was reactivated.

Mr. Thomas replied that an informal proposal was sent to DLNR and he anticipates meeting with them to discuss if they are interested in reactivating the committee.

Co-Chairman Ha inquired on what kind of equipment is available now that was not available in the past.

Mr. Thomas stated that there is a technique called a magneto telluric survey. It involves an instrument that looks at natural occurring electrical signals underground.

As a potential subzone for geothermal, Mr. Kahawaiolaa asked for an estimate on how long the east rift zone's heat would remain hot.

Mr. Thomas stated that it's certain that the Big Island will eventually move off of the hot spot. However, the rate of movement is extremely slow. His estimate is that Kilauea's east rift zone will remain active for at least another half a million years, and even after that, residual heat could continue.

First Nations' Futures Program Powerpoint Presentation provided by Kanoe Wilson. (See Attachment "B, C, D")

Ms. Kanoe Wilson explained that her presentation will touch upon the cultural perspectives on geothermal energy on Hawai'i Island. She briefed the members on the First Nations' Futures Program. The First Nations' Futures Program is an international alliance between Kamehameha Schools, Stanford University, and Maori from Aotearoa (New Zealand).

Ms. Wilson stated that FNFP is a leadership-development program which is involved with various community issues. This year they are tasked with investigating geothermal energy. The key note will be to look at various perspectives out in the community and to find a way to educate and promote the broader understanding of geothermal energy on Hawai'i Island.

According to Ms. Wilson, Kamehameha Schools has identified property on the west side of the island that has a potential geothermal resource.

Ms. Wilson said that her group generated a research question that would identify goals for the project. The purpose was to identify and analyze cultural, environmental, social, economical, educational, risks and rewards on developing geothermal energy in Hawai'i. Ms. Wilson mentioned that many group members did not have knowledge of geothermal energy. Therefore, rather than research everything on geothermal energy they decided they would be meet with organizations that had the expertise in this field.

Ms. Wilson briefed the members on past resistance by the native Hawaiian community. Their concerns included:

- Religious beliefs and customs
- Cultural and subsistence customs and practices; including access
- Hawaiian cultural sites
- Protection of burials and 'iwi kupuna
- Health issues from emissions
- Transmission lines through NARS and DHHL lands
- Ceded Land exchange
- Destruction of rainforest
- Impact of pollution on native birds, fauna and flora

Ms. Wilson distributed a handout on the "Legal Ramifications for Hawaiian Subsistence Practices and Rights and a timeline on Social Process in Hawai'i.
(See Attachment "C, D")

Ms. Wilson stated what the members need to be kept in mind about the native Hawaiian community is that the environment shaped them as "a people." The environment is key and critical as part of the Hawaiian foundation. It is important to understandwhere can a Hawaiian be a Hawaiian if not "Hawai'i?"

Ms. Wilson said that native Hawaiians are concerned about having to sacrifice their religion, cultural lifestyle, and identity for the benefit of others. These concerns need to be acknowledged, respected, and addressed.

Ms. Wilson recommended that the Geothermal Energy Working Group conduct listening tours. It is necessary to meet with the native Hawaiian community and receive input from them. She encourages the GEWG to meet and "talk story" with the Kupuna Advisory Group at the Hawai'i Volcanoes National Park. They have very diverse issues and they represent various backgrounds. The group consists of educators and former park employees who can offer their valuable contribution.

Ms. Wilson in addition recommended that the GEWG include a cultural impact assessment to the Legislature with their report.

Ms. Wilson mentioned that geothermal royalties are shared between the State, OHA, and the County. She suggested that there be consideration to create a special fund for educational purposes. It is important to look at future generations who will be involved in the development of geothermal energy. Ms. Wilson informed the members that the University of Hawai'i at Hilo is preparing a proposal for an engineering program. A special fund could assist our youth by offering them an internship program in engineering. It is necessary to educate the future generation that will be one day running these facilities.

Ms. Wilson informed the GEWG that her group called "Papahuilhonua" created a website in order to provide information on geothermal and to use it as a bulletin board for upcoming events. The website address is www.papahulihonua.blogspot.com. The video from the symposium is also available on the website.

Ms. Wilson entertained questions from the Geothermal Energy Working Group.

Co-Chairman Ha stated that the Mayor directed the GEWG to meet with the community. He asked Ms. Wilson if she could suggest who the members should meet with to "talk story."

Ms. Wilson will provide the members with an outline that was developed identifying key individuals within the community.

Co-Chairman Ha commented that if Geothermal Technical Advisory Committee is reactivated and zones are identified they could meet with those specific communities to discuss the environmental and cultural aspect within that zone.

Co-Chairman Ishibashi stated that it very important to address the cultural and environmental impact in order to expand geothermal. He questioned how the GEWG should proceed with community discussions.

Ms. Wilson suggested that the members meet separately with the community associations, and also with the Kupuna Advisory group.

Mr. Kahawaiolaa recommended that the group travel to each district to meet with the each association.

Ms. Wilson named other individuals associated with her fellowship group. She will provide the members with a list of those individuals.

A member from the public inquired on how the royalties were divided.

Ms. Wilson responded that the royalty percentage is as follows:

- State – 50 percent
- County – 30 percent
- OHA – 20 percent

FUTURE MEETINGS

The members agreed on the following:

- Meetings will be scheduled through an email poll. Ms. Andrea Gill will assist.
- Committee on Scheduling Community Meetings:
  Richard Ha, Pat Kahawaiolaa, Bob Lindsey, and Jay Ignacio volunteered to be on the committee.
- A preliminary report will be completed by November 30, 2010.

UPCOMING AGENDA ITEMS

- Reports by subcommittee chairs
- Timeline on interim report

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Staff Secretary

William P. Kenoi
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Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
Hamakua Conference Room
25 Aupuni Street
Hilo, Hawai'i 96720

Minutes of Geothermal Working Group August 26, 2010

Attendees: Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Chairman Richard Ha calls the meeting to order and asks for any public statements. Kristine Kubat, a community and environmental advocate, addresses the group. She states that she intends to be a "watchdog" for the community and protect the public's interests by monitoring developments with geothermal energy operations and expansion at Puna Geothermal Venture. She also states that she suspects that there has been a lack of full-disclosure concerning past problems with PGV -- specifically, a "blowout" that occurred some years ago. She suggests that the lack of disclosure fuels suspicions in the community that the operation of the PGV electrical generation plant is dangerous to people and the environment. Finally, she admonishes the Working Group not to be an advocate for geothermal energy.

Chairman Ha advises Ms. Kubat that the Working Group is not under the sunshine law and is, therefore, not required to provide the public with access to the Working Group meetings or their findings. But, it is the Working Group's intention to keep the process open and the public is welcome to speak.

Chairman Wallace Ishibashi, Jr. thanks the speaker for her comments and asks, "How do you propose we move forward to address your concerns?" She responds that public meetings be scheduled and the community notified of the places and times. Chairman Ishibashi says that the processes the Working Group uses are still evolving, but that the speaker has valid concerns and that the community will be an important factor as the Working Group moves forward. He asks her to comment on the current conditions of the

PGV plant. She states that it has been operating for decades and appears to be safe -- that she knows of no emergencies or failures that threatened the public or the environment -- but, that there are still "a lot of suspicions" because the public doesn't know everything. She advises that there should be transparency in the process. She said that no overtly pro-geothermal information should come out of the Working Group's report. She said a community apology is needed; she proposed using the Pahoa Community Center. Also, there are rumors of the dumping of chemical toxins at PGV.

Chairman Ha asks if any other member of the public wishes to be heard. There is no response. Chairman Ha introduces Mitch Ewan who will give a presentation to the Working Group today.

James "Mitch" Ewan - ewan@hawaii.edu - Hydrogen Systems Program Manager - Hawaii Natural Energy Institute - University of Hawaii
1680 East-West Road, POST 109, Honolulu, HI 96821.
Technologist and applications specialist. Mitch had been in the hydrogen business for twenty-five years.
OFC: 808-956-2337
CELL: 832-212-6129
FAX: 808-956-2336
Presentation: Hawaii is the most petroleum-dependent state in the union. The County of Hawaii spends $1 billion per year on petroleum. By 2015 the projected cost of a barrel of oil will be over $200. Both transportation costs and business costs will be affected. However, Hawaii has sufficient renewable resources that can be developed to supply all of Hawaii's future energy needs. Big Island has 150% of resources compared to projected needs. Geothermal is the most effective, efficient, and fairly inexpensive to produce. Photo-voltaic is the most expensive to develop; wind is the least expensive. If energy is used to produce hydrogen, the outlook is especially promising.

The Clean-Energy Initiative mandates that 70% of Hawaii's energy be clean and renewable by 2030. Hawaii exports a lot of money for energy. Energy that Hawaii locally produces will keep money in the state and translate into more local jobs. Funding is available from various government agencies. For example, a public bus system for the Puna district is being developed that will use hydrogen fuel supplied by the PGV plant. US DOE is funding the buses.

Hydrogen can be produced from geothermal, wind, and biomass. 60% of municipal waste that is already collected (and whose biomass energy potential is lost when dumped) can be converted to fuel.

The GM Equinox runs on hydrogen - GM will introduce 100,000 vehicles to Hawaii as a testing site; the marine base on Oahu will be using this vehicle. Hydrogen can be used to store energy. Richard Ha asked what are the chances of bringing these cars to Big Island and Mitch Ewan said that there is a very good chance -- especially if refueling sites were in place. GM already has an office in Honolulu. Volcanoes Park diesel buses will be replaced with fuel cell buses.

The state has a $10 million fund for entrepreneurs who develop clean energy. There is a hydrogen fund. The Hawaii Center for Advanced Transportation Technologies (HCATT) was first established in 1993 as the Hawaii Electric Vehicle Demonstration Project to represent the Hawaii Consortium in the Defense Advanced Research Projects Agency's Electric and Hybrid Vehicle Technology Program. In 1999, it transitioned to the Department of Transportation's Advanced Vehicle Technology Program, and in 2001 it formed a partnership with the Air Force Advanced Power Technology Office and established the National Demonstration Center for Alternative Fuel Vehicles at Hickam Air Force Base in Honolulu. HCATT will be doing the Volcanoes Park bus-engine conversion and works with the USAF. Clear Fuels is a fuel company that develops hydrogen fuel through conversion of biomass.

Mitch Ewan is an advocate of the community-sized conversion plants, rather than large-sized mega-conversion fuel plants. Fuel facilities already exist on Oahu with plans for new construction. Big Island has a small wind-turbine automated plant to produce hydrogen that can be controlled over the Internet on the Kahua Ranch. Took a year to develop but works well.

HNEI will provide hydrogen to Volcanoes National Park for the fuel-cell buses. HNEI uses an electrolyzer. Park Services is working to get the approvals. $1.2 million funding from DOE. $1.2 million from State of Hawaii. 2 million visitors to the park will learn of the project. Target date: January 12. Hydrogen station is built and will soon be shipped to Hawaii. The movie theater and visitors center will be powered by hydrogen. Big Island can be ringed by hydrogen fueling stations and shuttle buses can provide a feeder service from people's homes in Puna to hydrogen-powered buses that will operate throughout the county.

Hydrogen will be used also as an energy storage system -- to take the extra PGV electricity for hydrogen conversion to be stored. Fertilizer is a by-product of the conversion and reduces agricultural costs. Fish farms can use the oxygen from electrolysis.

The Hawaii grid is at maximum for metered renewable energy since a petroleum generator must be in standby mode due to vagaries of wind and sun. A large electrolyzer can meet the power fluctuations in the grid while it is producing hydrogen and oxygen. Ammonia is a safe way to store the hydrogen and transport throughout the islands.

Question from audience: How large a roadblock is permit processing from the government?
Answer: If the power is produced for sale, rather than exclusively for the grid, permits would not be required.

The electrolyzer produces hydrogen and oxygen; nitrogen from the air can be combined to produce ammonia (NH3). 12,000 kWh can be produced for each ton NH3. 30

kilograms of hydrogen is equivalent to 30 gallons of gasoline. GM cars have a range of 150 miles on one tank of fuel.

Tube trailers (gas cylinders on trailers with safety features) dispense fuel and can be used as mobile stations. After proof of the concept is accepted the smaller electrolyzers will be replaced by larger as the operation becomes financially viable.

Question from Working Group: How much does it cost to run the fuel-cell bus system; is it sustainable or is funding required?
Answer from Mitch: Initially, subsidy funding will keep the project viable; an analysis of the trial-phase of the demonstration project will illuminate the hidden expenses. The geothermal-plant electricity will keep the greatest expense -- process electricity -- at a minimum. That fact attracted the DOE's interest in funding the demo project.

Question from Working Group: What is the cost for the electricity for the system already in operation?
Answer from Mitch: It is about 23 or 25 cents per kilowatt-hour on Oahu; we haven't negotiated a price with PGV, but we expect it to be about 5 to 7 cents per kilowatt-hour.

The reason the national park is being used is because there are vehicles there that the park service wanted converted, not because it is federal money funding the project. The reason the GM cars are on the military base on Oahu is because the the vehicles are prototypes and very expensive. The portable fueling stations are intended to be towed by hydrogen-powered trucks. The technology to store and transport the hydrogen fuel exists and is used everyday in many places on the mainland. The low-pressure systems are safe and inexpensive. Similar systems can transport fertilizer to farms and fuel to transfer stations.

Mitch showed slides of the GM hydrogen vehicles. Initially, the US Army is getting five, the US Navy is getting five and the US Air Force is getting five. Eventually, thousands of the vehicles will appear on the islands as GM rolls out the models for testing in Hawaii.

Several government and non-government entities can contribute tax money and grant money to the projects and need to be approached as soon as possible with requests for funding. When it transitions to a profitable commercial operation then local businesses will have an interest in backing the projects.

Question from the audience: What's the conversion cost between hydrogen and gasoline? Would car-rental companies be interested in using the fuel-cell cars in their rental fleets?
Answer from Mitch: It takes 60 kilowatt-hours to produce a kilogram of hydrogen - so, depending upon the cost of electricity, it can be competitive with gasoline, especially with a fuel-cell vehicle as opposed to a hydrogen gas vehicle. As the price of petroleum rises, the hydrogen fuel becomes more competitive and businesses can be certain what their fuel costs will be, rather than being at the mercy of foreign markets.

Question from the Working Group: How long before there are commercial quantities of hydrogen being produced?
Answer from Mitch: I'd give it the five-year window depending upon funding. A commercial electrolyzer can kick out a lot of hydrogen, but they are expensive - on the order of $2 million. In one year the parks buses will be working. Until the general public buys hydrogen cars or converts their cars, the fueling stations will be available, but under used.

Question from the Working Group: Can you explain how the hydrogen fuel-cell works.
Answer from Mitch: It is similar to a battery design; there are two gases, hydrogen and air, separated by thin plates that allow interaction with one another aided by a catalyst. In the process of combining together they create electricity. The electricity is used to power an electric motor.

Question from the Working Group: Do you anticipate that the fuel-cell car will replace the battery car?
Answer from Mitch: No, both technologies will coexist and improve over time. The fuel-cell works like a hybrid.

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After the presentation, the Working Group discusses the minutes from previous meetings, makes required changes, and formally approves the minutes. Richard Ha introduces administrative volunteer, Christopher Mann. Working Group discusses Sen. Kokubun's recommendations concerning what form the Legislative Interim Report should take. Chairman invites volunteer to discuss mechanics of compiling data and shaping the report through email and email attachments. The volunteer will act as editor and return the material to the Working Group so that all members can see the text of others and the progress of the overall document.

Nelson Ho suggests the Working Group determine the specific and substantive issues for the foundation of the report. Jay Ignacio asks the administrative volunteer to clarify how he will be assisting the Working Group.

Wallace Ishibashi recommends that all the sub-committees submit their text to the administrative volunteer who will put the material into an agreed-upon format and then distribute that to all the members of the Working Group.

Nelson Ho suggests that to start, an objective set of bullet points would give direction to the writers, who would then offer their own expectations and bring their own expertise to the project. Nelson Ho suggests the report include energy resources that credibly compete with geothermal.

Jay Ignacio states that the Working Group needs to know what specific writing assignments each member has.

Wallace Ishibashi recommends that the administrative volunteer create a list of writing assignments and provide that list to Richard Ha.

The administrative volunteer offers Richard Ha a list that is a synthesis of statements from SCR 99 that can be used as bullet points to make writing assignments. The Working Group agrees to continue the meeting and make the writing assignments from this list and some additional considerations.

Patrick Kahawaiola'a states that although public perception may be mixed learning that Jay Ignacio sits on the Working Group - as if HELCO might have undue influence -- nevertheless, the group needs his expertise to make the best recommendations to the legislature. Patrick Kahawaiola'a inquires that, since it is HELCO's position that further expansion of the electrical grid will not include petroleum-based generators, will geothermal be the number one alternative or will other types of electrical energy generators will be used?

Jay Ignacio states that given the practical considerations of increasing demand, design dependability, and past history, at this time it would be unwise to depend entirely upon geothermal plants for the island's energy needs. A statistical analysis of probabilities will likely tend toward a mix of alternatives and fossil-fuel generators. The utility and prudence of keeping fossil-fuel energy available to the grid represent the most reasonable approach.

Barry Mizuno opines that demand for energy of all sorts, transportation as well as electrical house power, will doubtless increase. Accepting that fact, Hawaii is best served by developing resources that are available locally rather than depending on resources that the island doesn't have.

Nelson Ho and Patrick Kahawaiola'a agree that it would be helpful if Jay Ignacio could provide specific energy-demand projections and potential resources to meet those needs so that they could approach communities that would be affected by construction of power plants, present the facts and ascertain public reaction.

Richard Ha states that there have been changes to conservation land rules and changes to sub zone protections that the Working Group needs to be aware of.

Patrick Kahawaiola'a states that if all the geothermal plants are scheduled for construction on protected lands, everyone might as well go home.

William P. Kenoi
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Geothermal Energy Working Group
Hawai'i County Building
Puna Conference Room
25 Aupuni Street
Hilo, Hawai'i 96720

Minutes of Geothermal Working Group October 11, 2010

Present: Andrea T. Gill, Ted Peck, David Matise for Carlito P. Caliboso, Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Guest Speakers:
Patricia Brandt, IDG CEO/Board of Directors
Mililani Trask, Indigenous Consultants
Roberta Cabral, IDG Senior Advisor
Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

John Olsen, a member of the Puna community: John Olsen is not representing the Sierra Club at this meeting. He states that for 20 years he has experienced trouble. People are making a political decision rather than scientific or economic-based decision. He is very familiar with the development of geothermal energy. Mr Olsen expresses concerns that decisions based not on costs or accurate projections. Cost / Benefit - information has not been shared. Quotes the MIT Chair of Energy and offers a handout of the professor's opinion that Solar Energy is the best choice.

Steve Dearing, project manager for Kealoha Energy - filling in for the designated speaker, Ms. Kuulei Springer, who could not attend today - developing a 25 to 30 MW facility to replace the oil-burning plant in Hilo. The late James Kealoha was founder of the company. Cost is $3 million per MW. Proposes a $90 million plant for Puna. Time to become self-sufficient and

cease the oil-based energy power system. He advocates geothermal as part of non-fossil grid generation. 89 acres already designated for geothermal and ready to drill test wells. Rates on Hawaii are higher than on mainland. Proposes Kealoha Energy will cut electrical rates and create jobs. Local residents can be hired to work for Kealoha Energy. Many companies are ready to do the construction. Property will be leased to operator for percentage of profits. Asks for Working Group's support to have Kealoha Energy provide clean and reliable energy. Co-Chair Richard Ha invited the company to make a formal presentation to the Working Group. Mr. Dearing states that paying 35 cents per kilowatt hour "is obscene." Geothermal Developments is a small company, but will partner with larger groups to get the job done: possible growth to 70 MW. Contact and information at: kealohatrust.com.

Member Nelson Ho. stated it was the first time he was aware of another geothermal proposal in Lower Puna and concurred with Chair Ha in requesting that Kealoha Trust and Ms. Springer be formally invited to make a presentation.

Mr. Dearing states that he has not been able to get through to the Working Group. He is not a fan of the Sierra Club. He was offended that his presentation was not warmly accepted. ORMAT has held up the Kealoha development for 17 years.

Moani Akaka: Was in a photograph when the geothermal well had a caustic blowout in early days. Has reservations about geothermal. However, if it is to be done, it must be done properly to avoid the problems of the past. Local community was adversely affected by failings of the first plant. Says geothermal should be owned by local population and benefits provided to local population. The geothermal price should not be the same as oil-based electricity. Hawaii should not be industrialized like Pittsburg; ORMAT is obsolete - 3 decades without benefit. Working group must prove that geothermal is safe. Insulted that anyone would demean the Sierra Club, who protect the aina.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: hopes for success of the working group, however, the group seems to advocate PGV to the exclusion of alternatives, like an addict to replace fossil fuel with geothermal injected into the same system. Other ways could be available, direct-use applications, jars sterilized for food sold at farmers markets, for example. Small-scale technologies are a potential. If oil runs out, H2 generation from excess PGV production is a good idea, but for community, not just tourists. Mitch Ewan's idea to develop hydrogen buses was initially for tourists - not the plan has grown to include community transportation. Compressed air may be superior to hydrogen. Danger is alliances that are formed between existing groups to protect the status quo - others need to be represented and future generations must benefit, also. Think ahead and progress is possible.

Co-chair, Wally Ishibashi states: this is not a PGV committee and that the Working Group is willing to listen to all voices and alternatives.

Member, Ted Peck states that Mitch Ewan is under contract with the Energy Administrator to fulfill the Hydrogen Fund.

Member, Patrick Kahawaiola'a advocates going to communities to receive the public's energy concerns - anyone willing to schedule a meeting, please do so. The host culture should benefit from developments and improvements in the state.

Moani Akaka: Office of Hawaii Affairs receives revenues from ORMAT - the Puna community should benefit more and that benefit should be visible.

Co-chair, Richard Ha: attended Peak Oil Conference in Washington, DC. Reads from website. Platts News Service is a leader in providing energy-related news regarding energy price assessment. A panel of geologists and energy analysts debated Thursday the severity and timing of an anticipated oil crisis, with one saying during a Washington briefing that crude oil production has now peaked.

"The global rate of production of oil is peaking now,"said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin. "The size of accumulation [of oil] is not equated to the rate of production," he said. Frank Rusco, an energy director at the US Government Accountability Office, estimated some 45 years of "proven reserves," though current and future oil demand will stress supplies.

"Higher oil prices can retard economic growth and even cause a recession in the right circumstance," Rusco said at the briefing, which was organized by the Association for the Study of Peak Oil and Gas. He declined to say after the briefing what a gasoline price ceiling might be for US consumers. "The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," Rusco said, citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper." Meanwhile, "mitigation of oil dependency by transitioning into other energy sources will take upward of a decade to come into play. "Sometime after a decade, mitigation will take impact and things will start to flatten out," Hirsch said.

New reserves from Brazil and production from unconventional sources in the US will not be enough to compensate for depleting reserves, panelists said. The Ghawar oil field in Saudi Arabia, still a bright light in the petroleum world, could see a sharp and imminent decline in production, Patzek said. If Ghawar "peters out, to replace it [with production elsewhere] will be a very difficult task," he added. He estimated Ghawar's current production at between 4.5 million and 5 million barrels per day, though added that actual production figures are unknown as they are a "top secret."

Later, on the sidelines, Patzek said Ghawar could become the region's Cantarell, referring to Mexico's offshore oil field that has seen production plummet by over half from a peak 2.1 million barrels per day in the mid-2000s. Patzek said that the ongoing water-flood efforts into the Ghawar field to stimulate production will eventually taper off. "You're injecting twice as much water into the well," he said. "Your field is watering out," Patzek said in an interview

Patzek told the briefing that Norway's reserves have peaked, while he characterized the decline rate in the US Gulf of Mexico as "very high." BP's Thunder Horse well in the Gulf "has not reached its potential and it's declining faster than people thought," Patzek said. A BP spokesman was not immediately available for comment on Patzek's remarks about Thunder Horse.

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference. "This is not a recovery that we're in," said Nicole Foss, a former fellow at the Oxford Institute for Energy Studies, who predicted "chaos" in foreign currency and equity markets within years. A severe deflationary plunge will contribute to a liquidity crisis among the financial sector, Foss said on a peak oil panel late last week. The meeting in Washington wrapped up Saturday.

"Oil will bottom early in this depression," Foss said. She and fellow panelist, energy analyst, Chris Martenson, predicted that foreign currency markets will become more volatile, with domino effects on global money supply. "It's not unthinkable the the US will have another financial crisis," Martenson said, adding that he gave the US a "50%" shot at having a fiscal crisis and a "50%" chance of experiencing a currency crisis. "We're going to see severe dislocations in the foreign exchange markets."

Deflation is tomorrow's problem," Foss said, adding that a lack of purchasing power will undermine price support for crude oil. Then "printing [money] is a few years off," she said. "We could see $20 per barrel and then $500 per barrel within the space of five years," Foss said. Foss runs the Agri-Energy Producers' Association of Ontario, where she has focused on farm-based bio-gas projects and grid connections for renewable energy. At Oxford, she researched electricity policy at the EU level, according to her website. She was previously editor of the Oil Drum Canada, where she wrote about peak oil and finance.

Speaking on the sidelines of the conference, Foss said that natural gas holds no promise as a safe hydrocarbon haven in a scenario of volatile crude oil prices. There is a "perception of a glut" of natural gas reserves and other resources from new shale plays and coal-bed methane and tight formation gas Foss said. "I would argue that this is an illusion," Foss said. The environmental cost of extracting unconventional resources "is tremendous," Foss said, adding that the energy resource "bang for buck" is unappealing. "We'll end up with natural gas price spikes, "after years of low natural gas prices," she said.

As demand out paces supply, the urgency to do something to anticipate the crisis becomes greater. Hope replaces shock if we agree that we can figure out ways to help fend off the panic 2 to 5 years away from oil spike - lowest economic group will suffer the most when prices rise. An analysis of $200 per barrel oil, even without great detail, it would be devastating to the Hawaiian economy.

To compare: 35 acres of geothermal equates to 35,000 acres for bio-mass -- 7 cents per pound if farmer were to grow bio-mass without subsidies -- it would never happen.

Member Nelson Ho suggests to discuss these matters later on in the agenda to permit presentations would be more appropriate.

Presentation by Innovations Development Group - Patricia Brandt, CEO/Board of Directors, Mililani Trask, Indigenous Community Advisor, Roberta Cabral, Senior Advisor. Office email: info@idghawaii.com.
Michele, Staff Assistant. Ryan Matsumoto.

IDG has 10 years experience with geothermal and represented the Maori of New Zealand in three energy-development projects. The overarching approach is to respect human rights while developing energy resources: Native-to-Native process. IDG is an Hawaii-based strategic planning company that is focused on renewable energy development. IDG wants Hawaiians to control their own resources. In New Zealand, the Maori Queen and IDG developed plans to coordinate contacts with the experts to develop locally-owned resources. Equal representation is the key to a successful geothermal drilling. Improvements in technology are required to avoid toxic venting of gases, adverse impacts to the environment, and to provide for the general benefit of the community. IDG provide expertise choosing the best project, the right developer, and training for local people.

Mililani Trask presented an outline of the Native-to-Native model -- recognize human rights of homeland to benefit from development. Must address climate change and renewable resources. Old model of resource exploitation is outmoded. UN declaration for human rights is the foundation to the development model - preserve cultural heritage - environmental sustainability - socially responsible. Hawaii most at risk for shortage of fuel due to dependency on energy - Hawaii County is the largest landmass in US capable of being energy self-sufficient. Development of firm-power geothermal needs tax incentives - policy needed that recognizes geothermal is primary resource of ceded land trust. Carbon footprint shared by all who drive and use energy. Geothermal development requires a community collaborative model - equitable sharing of resources. How do Hawaii Renewable Energy Development Venture describe stakeholders? It shows who you are dealing with. Mostly corporate members are stakeholder. No local representation. Need cultural affiliations - equitable and fair - need to comply with legislation. Ignoring cultural considerations led to court proceedings. Also, it was cheap and filthy technology that led to geothermal blowouts 20 years ago. Need appropriate technologies for Hawaii's conditions. Environmental issues need to be addressed at the planning stage. Hawaii paying the highest rates for electricity in the country due to lack of participation in negotiations at early stages.

Pele Defense Case set standards - deviated bore (drilling at an angle) provides access to resources that lie beneath environmentally-sensitive areas. Community involvement needs to move first.

Three Economic Models: 1) ORMAT type is Build-Own-Operate and transfer of benefits years later 2) Royalties are pennies on the dollar - not equity benefits - fixed fees per MW 3) Equity owners at all levels are invited to sit at the table. Participation means shared income.

Roberta Cabral - The general public and native interests are vested in indigenous mineral and geothermal is a mineral. Initial investment in research is critical for later negotiations with investors and developers. The negotiation model leverages community, investors, and developers interests. Need to partner with bonafide geothermal developers. IDG proactively seeks support of local population with Community Collaborative Model. IDG specializes in community connections as well as understanding that geothermal shall not be the exclusive resource - but, an important resource. Risk is capable of being measured - that relates to the cost of capital - Collaborative Model structures a PPA (Power Purchase Agreement) with percentage of surplus cash dedicated to the developer and share a percentage of the proceeds in a community trust. IDG provides protection for developers by paving the way for community partnership. The community receives benefit from the trust.

Member, Ted Peck states that there is some question as to whether or not the PUC would approve this type of trust with money going into it. The legislature must set policy for this type of model - community equity - change in model now - cannot undo what contract-in-place stipulates under Hawaii's constitution.

Roberta Cabral - money from project to community can be used for stewardship; trust fund goes to community's benefit: parks, businesses, educational scholarships, farming, fish tanks, fish drying, spas, etc. Technical and financial partners chosen by IDG, who assume risk. IDG strategy is to bridge the gap between community and developers. IDG thinks geothermal is the way to go.
IDG wants to be selected as a preferred geothermal developer. IDG has the experience and the expertise to do the deals.

John Olsen, a member of the Puna community, states that actually it is the community that takes all the risks - money is just paper. The evacuations of Puna residents due to venting demonstrated that fact.

Member, Nelson Ho requests a copy of the IDG presentation to be reviewed in detail by the committee.

Co-chair, Richard Ha, suggests IDG create a proposal for legislators.

Member, Jay Ignacio states - need to balance disclosure to legislation and proprietary information of IDG's. Since SCR99 directs the Working Group to report on establishing a community-benefits package, IDG's model may fulfill that requirement.

Member, Ted Peck states that the community-equity model needs to be articulated and some statutory language may be the starting point.

Presentation by Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii - guy@EnergyFutureHawaii.org
Speaking about the NH3 Energy Conference in Detroit.
NH3 is ammonia and the point of the conference is to demonstrate that ammonia is a good way to carry energy. Geothermal is a good way to create ammonia. Expansion of geothermal

must occur first - before secondary industries can be established. Farmers need fertilizer to get nitrogen into the soil. Ground transportation is the single largest use of fossil-fuel energy, so load varies with tourism in Hawaii. Geothermal can be used for ground transportation, as well.

Off-peak hours, curtailment which could mean waste (with fossil burning) or production if used to convert water to H2. Electrolyzers are used. H2 can be used to fuel transportation, but H2 vehicles don't represent a very large part of the transportation system. So, at 2008 Conference, the speaker, Richard Ha, asked Guy about converting H2 to ammonia. HNEI slide - ammonia is the practical man's hydrogen. Synthetic Urea (a dry form of ammonia fertilizer) accounts for 3.6 tons of NH3 per day on island farms. If geothermal were expanded to 720 MW it would create enough gasoline-equivalent can provide fuel for all autos on Big Island. The Dept of Energy with matching state funds have a pilot project to build and maintain 2 hydrogen fuel buses.

Member, Ted Peck states meeting with Mayor today and discuss feasibility of transforming all county buses to H2 and what is timeline.

General Motors and fuel companies are introducing Project Driveway - vehicles that use H2 and an infrastructure to support it.

Ammonia is a good way to move energy. Ammonia to Oahu for power instead of the expensive power line. Ammonia is denser with hydrogen than liquid hydrogen. Ammonia could be an exportable commodity. The energy conference demonstrated many different research designs that used ammonia as the fuel source. Renewable Hydrogen Network - Japanese graphic of renewable ammonia combined with H2 and O2 for best fuel. Injection of water into ammonia improves fuel characteristics.

Member, Ted Peck asks about the capital investment for ammonia plant - Guy Toyama will provide the report. Mr. Peck needs to leave for another meeting.

-- Ten-minute recess --

Co-chair, Richard Ha: Call back to order

Working Group Members discuss the Geothermal Interim Report for Hawaiian Legislation - Format and content

Member, Nelson Ho states some concerns: that the working group is not ready to answer / address all aspects of the information required for the legislation 1) revenue sharing - especially for the least represented 2) impacts to PGV neighbors: air quality / noise 3) DNLR's role in process 4) regulatory agencies' input 5) all forms of energy have subsidies - stated or not - need scientific information regarding expansion of PGV's present capability.

Co-chair, Richard Ha: Need to discover from Working Group Member, Bob Lindsey - where does the money go - what benefits?

Co-chair, Richard Ha asks Working Group Member (HELCO), Jay Ignacio, what needs to happen to take the next step?

Member Jay Ignacio says a Resource Plan will address what mix of resources will be used going forward. Clean Energy Scenario Planning (undefined at present) - Identify the resources, location dependent, stability is essential. HELCO will produce a study, but not the official public utility plan, outlining the integration of resources. The essential requirement is to move from high-level discussion to defining the specific resources and their particular locations and capabilities. Geothermal is an option, but without certainty of investment, developers won't begin building and without existing facilities, HELCO cannot plan assuredly to integrate into the grid.

Member, Andrea Gill: Needed are detailed resource assessments defining the scope of available energy and how it can be developed. There can be no absolute certainty about a resource. Only drilling and actual steam production will verify - so need to find the level of comfort in planning using exploration data to project future growth and integration of new power plants. Also, Kealoha Energy's plan is more preliminary than has been asserted.

Member, Jay Ignacio says that working with researchers to identify high-probability resource locations is a first step, the determine how development will be funded.

Member, Nelson Ho: Regarding baseload growth of power production, what is the recommendation according to HELCO's last completed plan? What estimate did HELCO make in terms of baseload growth in MWs? What's the preferred type of plant?

Member, Jay Ignacio: Theoretically, all fossil-fuel power plants could be replaced. If the resource is viable and a benefit to HELCO's customers, the PUC would approve a change to geothermal plants. Last filing of projections predicted a 2010 need above 200MWs peak. Presently, peak is about 185MW. That means the plan for bringing on a firm, large-capacity generator in 2020 can be pushed further, since demand has not reached projected growth. On-site generation and the economic downturn altered the growth in demand. In 2022 or 2023 there is a plan to bring on another geothermal plant, but not sure how it will come about. The preferred type of plant meets the needs of the customer: reliable, low cost, and no adverse impact on the environment.

Member, Andrea Gill: Can HELCO's contract with Hamakua Energy be displaced with expanded geothermal?

Member, Jay Ignacio says HELCO has a thirty-year contract with Hamakua Energy that goes out to 2030. They are compensated in two ways: 1) for being available - capacity and 2) for the energy HELCO uses.

Member, Patrick Kahawaiola'a asks if geothermal at PGV is producing at capacity and if HELCO is buying all power produced. What resources can provide electrical system stability in addition to fossil-fuel plants?

Member, Jay Ignacio says HELCO curtails purchase of power from PGV at night. Shows a graph of the electrical load profile. As demand decreases, certain plants can be curtailed. Oil-fueled steam plants cannot be taken off-line without rendering the system unstable. New designs of geothermal will have the reliability required to ensure stability to the grid, but the current design at PGV does not and, hence, cannot dependably and safely displace the oil-fueled plants. But, in parallel with exploring alternative energy resources, HELCO is exploring alternative fuels. Bio-mass may not be the answer, due to economic constraints, but alternative fuel sources are an option.

Kristine Kubat asks Jay Ignacio if HELCO sees itself as a developer of alternate energy and alternate energy resources?

Member, Jay Ignacio states that HELCO is flexible in the matter of bringing new resources to the system. The utility has the burden of providing service. An independent provider does not have an equivalent responsibility. If HELCO retires its plants and is no longer financially viable, it cannot provide the service as mandated by the public.

Member, Nelson Ho says it is the nature of geothermal that it cannot be throttled back to match demand, the steam is thrown back into the earth and wasted.

Member, Jay Ignacio says that using geothermal energy independent of the electrical power grid would permit more geothermal to be developed effectively and, for example, electrical transportation would provide that use. Nevertheless, geothermal's short-comings have to do with the technical/engineering side and the geophysical limitations of the resource.

Member, Nelson Ho says that the geophysical limitations are what John Olsen and Sierra Club have been pointing to all along. The resource is about pinpointing discrete water and rock formations that have desirable characteristics and that operation is problematic has a great deal of risk and uncertainty associated with it.

Member, Jay Ignacio says that the trouble is often the extraction; wells get clogged and can no longer produce, so other wells have to be drilled to replace them.

Co-chair Richard Ha asks if it is about the return on investment - if enough wells are profitable and productive, the systems works well. It is about managing the resource.

Member, Nelson Ho says that if the relevant problems are defined in the Interim Report, the group will be on its way to providing information to help solve the problems.

Member, Jay Ignacio says the problems with accepting photo-voltaic energy and the contracts that exist with wind could mean that later contracts are turned away before older commitments. So, even if geothermal proved to be less expensive, HELCO might be prevented from buying it.

Member, Patrick Kahawaiola'a says people outside of the working group don't understand that part -- and need to be told. If geothermal will be available at 6 cents per kilowatt, but HELCO has to pay 35 cents for wind because of an oil price spike, people will be confused and angry.

Co-chair Richard Ha says that the inter-island power connection starts to make practical sense - especially, as resources costs rise.

Member, Andrea Gill asks, is HELCO paying 15 cents avoided-costs for wind regardless if it is firm or intermittent?

Member, Jay Ignacio says, Yes. Contract exists for a long time. If we don't take aggressive steps to expand geothermal, especially if oil prices go to $200 per barrel, there will be problems supplying energy to meet demand. It will take time to prove reliability and come to be a dependable part of the system. It is at least a year to bring a plant online. How well that source will be managed is fundamental to the level of confidence. Plants cannot be retired until there is demonstrated reliability and a redundancy in case of problems. Propose that HELCO runs two simulations to provide data on how transmission expansion scenarios would play out.

Member, Andrea Gill says new resource data is needed to remove uncertainty regarding growth and stability. Landowners can request to be in a subzone or removed from a subzone if it appears a resource is there. Need to work through the DNLR. The DNLR can create a committee as it did before. Currently outlining the issues for the Interim Report.

Next meeting have a draft of report to look at. Propose November 8, 2010 as date for next meeting.

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

County of Hawai'i
Office of the Mayor

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Geothermal Energy Working Group
Hawai'i County Building
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Minutes of Geothermal Working Group November 8, 2010

Present: Robert Lindsey, Ted Peck, Carlito Caliboso, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: states that she has read the Working Group Interim Report draft and objects to the optimistic language regarding geothermal. Petroleum analysis is plentiful, but there is limited analysis for geothermal. Despite the fact that Big Island is located above a geothermal hotspot, the resource available for geothermal may be depleted. In her estimation, geothermal is not a renewable resource. She says that the report should so state. She objected to the statement: a resident could have their property removed as a subzone designated for geothermal if the resident so desired. The petition is difficult for people to do. Also, she asks for facts about HELCO plans to retire oil-fired generators. Also, she asks PGV to come forward with facts. How much does it cost to build a geothermal plant. The concept of firm-power for baseload needs to change. Depletion, firm-power, geothermal resource subzones all need to be defined clearly. She wants to make some recommendations in the final report.

Jon Olsen, a member of the community, says he and 87 others withdrew their properties from the designated geothermal subzones. The state did not respond favorably to their certified letter. He has copies of legal filings and he will provide when necessary. He expresses his concern that the current evacuation zone around PGV hasn't been discussed.

The EPA requested that the state and county create a notification program and that has not occurred. There is a concern about heavy metals and sulfur being released into the environment around PGV. He believes every chemical is within seawater, many are dangerous, and the geothermal plant wells may release them.

Steve Phillips, a member of the Puna community, had a bad experience with geothermal before. He said that the law should be changed to permit a contested case hearing. Any new development that impacts the community must uphold the rights of those in the neighborhood. He stated that geothermal gases poisoned his son in his crib. He stated that he lost his marriage because of geothermal. His property values went down because of geothermal. He said he wrote rules for a geothermal asset fund that were never used. How will the mess of a decommissioned plant be funded when it needs to be dismantled? That is what the asset fund is for. He will do everything in his power to halt geothermal development unless the community has a contested case hearing. The community led to improvements over the poorly designed and built experimental well.

Robert Petricci lived in the neighborhood during the development of geothermal and was evacuated years ago when there was an open venting. He also wants a contested case hearing. There will be problems if geothermal is built where people live. Also, geothermal developers must not cut corners during construction.

Member Robert Lindsey says he thinks a contested case hearing is a good idea and fits in with SCR 99. To move forward with geothermal means that we must contend with some of the past errors.

Co-chair Wally Ishibashi says everyone knows some things were done wrong in the beginning, but we are moving in the right direction now. Everyone wants things to be done correctly. We are trying to do the best we can.

Member Nelson Ho says the legislature took away the contested case hearing and that the Working Group can make a recommendation.

Member Carlito Caliboso says that the Interim Report should focus on the issues directly related to SCR 99.

Member Ted Peck says since it is the Interim Report, we don't need all the answers.

Co-chair Ha asks if anyone has suggestions on how the report should go.

Member Carlito Caliboso reiterates that the report should only address the points expressed in SCR 99.

Member Ted Peck says the report can tell the legislators: here are the answers to these problems and here are the issues we need to track down. Also, the Executive Summary needs to be really tight.

Co-chair Ha invites the volunteer editor to the working group table to receive point-by-point instructions and edits of the report draft from the working group members. Appendices can

be used for bulk information and details referenced in text. Also, PDF files permit members to make comments on the text. A discussion of the executive summary ensues regarding key points and the possibilities of disagreements and unresolved issues. The members resolve to work on the Interim Report via email. There is a need to assess resources specifically. Need discussion of geothermal electricity potential, but also secondary industries, such as hydrogen and ammonia production. The scope of the resolution forms the basis of the contents of the report and the over-arching analysis of baseload feasibility. However, there is a need for context regarding peak oil and other considerations that provide the basis for the working group's recommendations to the legislators.

Member Nelson Ho states that the report should be lean and cut-to-the-chase rather than offer too much information. The information needs to be clearly stated. Since the environmental impact is site specific, there can be no information on the impact without identifying the location of the resource or how it will be developed.

Member Barry Mizuno agrees that the most critical issue should be to identify the resources available. More testing is needed.

Member Ted Peck points out the shortcomings of available data on geothermal. Report needs to discuss issues as well as upside.

Members Ted Peck and Nelson Ho discuss the pros and cons of mediation versus contested case hearing with the community members.

Co-chair Richard Ha discloses his discussions with a development group who are investigating the possibility of developing geothermal on Big Island. He has not joined with them and will keep the working group aware of his role, if any.

Members Nelson Ho and Barry Mizuno discuss the role of geothermal in the future and the need for geophysical data.

General discussion of format and structure of next draft using printout of existing draft among Working Group members and volunteer editor. The consensus is to build the report so that it is concise and focused on the SCR 99 mandates. Circulate the next draft in three sections: Executive Summary, Working Group writing assignments, and Appendices. Start with addressing using geothermal as primary energy resource as the Working Group conclusion and the additional uses (transportation and ammonia production) as secondary benefits.

Member Carlito Caliboso states that there may be a conflict if he supports geothermal uses before the legislation and is later asked to decide on geothermal development with the PUC.

Member Ted Peck states that even if members must recuse themselves from advocating for specific development, it is appropriate for the Working Group to assert its principal findings: that multiple geothermal plants are the most prudent approach, that historically geothermal is a lower-cost energy resource, it has the potential to supply baseload electricity, although it has not yet demonstrated baseload consistency in its application in Hawaii. It is a renewable resource indigenous to Big Island and can neutralize the price volatility of petroleum fuel for the county both in terms of the electrical grid and in terms of transportation. Additionally,

products that assist in island agriculture can be cost-effectively produced with geothermal and replace the importation of products made on the mainland from fossil fuels. Thus, it has a significant potential to be Big Island's primary energy resource.

Member Jay Ignacio advises that reliability is essential to satisfy the utility's need for dispatchable energy on demand.

Member Barry Mizuno suggests that if other geothermal plants were in operation and each one of three produced the mega wattage for the grid as well as electricity to create other products and services, than the combination of generation beyond the grid's requirements would permit reliability so that, if needed, one or more could serve in another's place.

Member Ted Peck states that a robust environmental impact statement can mitigate community concerns. A general discussion concludes that the contested case hearing be explored, but not recommended to the legislation at this time.

Member Jay Ignacio cannot speak to the intricacies of specific expansion of the HELCO grid, since that requires detailed study. However, he proposes a HELCO-funded, high-level study to look at a hypothetical expansion in two locations.

Member Ted Peck states that funding would be necessary to fully analyze the impact of a transition to geothermal. For example, shippers and dock workers may loose work importing supplies for petroleum-based plants. It is generally concurred that funding is needed and that the Working Group should recommend the legislation make it available.

Co-chair Wallace Ishibashi points out that there are two projects the Working Group recommends be funded: first, testing and identifying specific locations that hold promise to be geothermal generation sites and second, analyzing the impact of transition to geothermal upon the existing infrastructure. Resource analysis and impact assessment.

Community benefits discussion concerning the best approach and advisors to consult. Community benefits can include Volcanoes National Park hydrogen buses and agricultural fertilizer.

Member Robert Lindsey identifies the resources and people who will be supplying information for the community benefits section. Recommend to the legislation that royalties from geothermal be identified and ear-marked for local community benefits rather than going into the general fund.

Co-chair Wallace Ishibashi asks about royalties calculation and distribution. The legislation will have to address the percentage distribution when it comes up.

Member Barry Mizuno explains that the royalty is calculated according to the value of the resource using a formula developed by DNLR and the US Department of Interior; from that figure, 10 percent of the resource value is designated royalty.

Member Nelson Ho asks Richard Ha about IDG and the consortium who wants to develop geothermal.

Co-chair Richard Ha replies that the general idea seems good, but it is too early and nothing substantial has been done yet.

Meeting adjourned.

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WARRANTY DEED AND GRANT OF ACCESS EASEMENT

KNOW ALL MEN BY THESE PRESENTS:

THAT, effective as of the __ day of _____, 2006, **THE TRUST FOR PUBLIC LAND**, a California nonprofit public benefit corporation, whose address is 116 New Montgomery Street Third Floor San Francisco, California 94105, hereinafter referred to as "Grantor" and the **OFFICE OF HAWAIIAN AFFAIRS**, a body corporate and instrumentality of the State of Hawai'i, whose address is 711 Kapi`olaniBoulevard, Suite 500, Honolulu, Hawai'i 96813, hereinafter referred to as the "Grantee," for a valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor does hereby grant, bargain, sell and convey unto Grantee, its successors, assigns and representatives, in fee simple, those certain parcels of land situate at Puna, Island and County of Hawaii, State of Hawai'i, designated as "Wao Kele o Puna," containing an area of ± 25,855.891 acres, more particularly described in Exhibit "A" attached hereto and made a part hereof.

TOGETHER WITH a non-exclusive easement for access purposes granted to The Trust for Public Land, a California nonprofit public benefit corporation by C.R. Churchill, D.A. Heenan, Richard W. Gushman, II and Ronald J. Zlatoper, the duly appointed, qualified and acting Trustees Under The Will And Of The Estate Of James Campbell, Deceased, acting in their fiduciary and not in their individual capacities, by that certain Grant of Easement for Access Rights made as of July 14, 2006 and recorded in the Bureau of Conveyances of the State of Hawai'i ("Bureau of Conveyances") on July 14, 2006 as Document Number 2006-129681, over, across and through the road shown on the map attached hereto as Exhibit C-1 and incorporated herein by reference, which crosses the property described in Exhibit C-2 attached hereto and incorporated herein by reference, for the benefit of both Tax Map Key Nos. (3) 1-2-010-002 and 003, subject to the terms and conditions set forth therein.

AND the reversions, remainders, rents, income and profits thereof, and all of the estate, right, title, and interest of the Grantor, both at law and in equity, therein and thereto.

TO HAVE AND TO HOLD the same, together with all improvements, rights, easements, privileges and appurtenances thereunto belonging or in anyways appertaining or held and enjoyed therewith in fee simple unto said Grantee, the Grantee's successors and assigns, forever, free and clear of all liens and encumbrances except as described on Exhibit "B" attached hereto.

The Grantor, for itself, its successors and assigns, does hereby covenant with the Grantee, its successors and assigns, that the Grantor is lawfully seised in fee simple and possessed of the above-described land and premises, that it has a good and lawful right to convey the same as aforesaid, that the same is free and clear of all liens and encumbrances, except as noted on Exhibit "B" and that it will and its successors and assigns, shall WARRANT AND DEFEND the same unto the Grantee, its successors and assigns, forever, against the claims and demands of all persons whomsoever.

AND the undersigned hereto agree that this instrument may be executed in counterparts, each of which shall be deemed an original, and said counterparts shall together constitute one and the same instrument, binding all of the parties hereto, notwithstanding that all of the parties are not signatories to the original or the same counterparts. For all purposes, including, without limitation, recordation, filing and delivery of this instrument, duplicate, unexecuted and unacknowledged pages of the counterparts may be discarded and the remaining pages assembled as one document.

SIGNATURE PAGE TO FOLLOW

IN WITNESS WHEREOF, the parties have executed this instrument as of 11th day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By Ben R. Kudroff

Its REGIONAL COUNSEL

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

IN WITNESS WHEREOF, the parties have executed this instrument as of 1st day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By _____

Its _____

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

4

ACKNOWLEDGEMENT

State of California
County of San Francisco

On this 11th day of July, 2006, before me, **Hsiao-Wen Shih**, a notary public, personally appeared **Brian R. Kirchoff** personally known to me (or proved to me on the basis of satisfactory evidence) to be the person~~(s)~~ whose name~~(s)~~ is~~/are~~ subscribed to the within instrument and acknowledged to me that he~~/she/they~~ executed the same in his~~/her/their~~ authorized capacity~~(ies)~~ and that by his~~/her/their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

HSIAO-WEN SHIH
COMM. #1556562
Notary Public-California
SAN FRANCISCO COUNTY
My Comm. Exp. Mar 4, 2009

5

ACKNOWLEDGEMENT

State of Hawai'i)
) ss.
City and County of Honolulu)

On this 12th day of July, 2006, before me, personally appeared S. HAUNANI APOLIONA, to me known, who being by me duly sworn, did say that she is the Chairperson of the Board of Trustees of the Office of Hawaiian Affairs, a body corporate and instrumentality of the State of Hawai'i, and that in the absence of a seal that the foregoing instrument was signed on behalf of said Office of Hawaiian Affairs by authority of its Board of Trustees, and the said S. HAUNANI APOLIONA acknowledged said instrument to be the free act and deed of said Office of Hawaiian Affairs.

Notary Public, State of Hawai'i
Print Name: J. E. Okamoto

My commission expires: 7/29/10

ACKNOWLEDGEMENT

State of Hawai'i)
) ss.
City and County of Honolulu)

On this 12th day of July, 2006, before me, personally appeared CLYDE W. NĀMU'O, to me known, who being by me duly sworn, did say that he is the Administrator of the Office of Hawaiian Affairs, a body corporate and instrumentality of the State of Hawai'i and that in the absence of a seal that the foregoing instrument was signed on behalf of said Office of Hawaiian Affairs by authority of its Board of Trustees, and the said Administrator acknowledged said instrument to be free act and deed of said Office of Hawaiian Affairs.

Notary Public, State of Hawai'i
Print Name: S. E. Okamoto

My commission expires: 5/24/10

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EXHIBIT "A"

PARCEL FIRST [TMK NO. (3) 1-2-010-002]:

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL A, same being portions of the Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F No. 20,315 dated December 13, 1985), and thus bounded and described as per survey dated December 13, 1985, to wit:

Beginning at the west corner of this parcel of land and on the south boundary of Land Court Application 1053, the coordinates of said point beginning referred to Government Survey Triangulation Station "OLAA" being 47,769.67 feet south and 8,228.41 feet west, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	24,288.19	feet along Land Court Application 1053;
2.	345°	23'	30"	1348.57	feet along the remainder of Government Lands;
3.	313°	00'		1221.60	feet along the remainder of Government Lands;
4.	330°	16'		4682.10	feet along the remainder of Government Lands;
5.	262°	03'		1960.70	feet along the remainder of Government Lands;
6.	290°	02'		627.40	feet along the remainder of Government Lands;
7.	314°	28'		4581.80	feet along the remainder of Government Lands;
8.	314°	47'		744.40	feet along the remainder of Government Lands;
9.	314°	12'		735.30	feet along the remainder of Government Lands;
10.	315°	31'		1825.53	feet along the remainder of Government Lands;
11.	40°	41'		13.81	feet along the north side of 20-Foot Road;
12.	338°	15'		14.99	feet along the west side of 20-Foot Road;
13.	60°	05'	12"	25,840.22	feet along Parcel B of Government Lands;
14.	140°	23'		16,220.18	feet along Parcel B of Government Lands to the point of beginning and containing an area of 9,012 acres, more or less.

PARCEL SECOND [TMK NO. (3) 1-2-010-003]:

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL B, same being portions of Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F. No. 20,316 dated December 13, 1985), and thus bounded and described as per survey dated December 13, 1985, to wit:

Beginning at the west corner of this parcel of land and at an angle on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 55,748.70 feet south and 22,096.90 feet west, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	16,000.00	feet along Land Court Application 1053;
2.	320°	23'		16,220.18	feet along Parcel A of Government Lands;
3.	240°	05'	12"	25,840.22	feet along Parcel A of Government Lands;
4.	338°	15'		3262.76	feet along the west side of the 20-Foot Road;
5.	340°	23'		19.26	feet along the west side of the 20-Foot Road;
6.	342°	31'		250.51	feet along the west side of the 20-Foot Road;
7.	337°	27'		156.17	feet along the west side of the 20-Foot Road;
8.	347°	14'		271.04	feet along the west side of the 20-Foot Road;
9.	348°	38'		331.85	feet along the west side of the 20-Foot Road;
10.	353°	51'		125.10	feet along the west side of the 20-Foot Road;
11.	359°	30'		1278.10	feet along the west side of the 20-Foot Road;
12.	358°	59'		2128.77	feet along the west side of the 20-Foot Road;
13.	332°	38'		221.69	feet along the west side of the 20-Foot Road;
14.	315°	33'		287.92	feet along the west side of the 20-Foot Road;
15.	258°	17'		9.45	feet along the south side of the 20-Foot Road;
16.	352°	29'		6915.35	feet along Parcel C of Government Lands;

17.	56°	27'		1460.60	feet along Lots 3-B and 3-A of Upper Kaimu Homesteads;
18.	39°	38'		3534.10	feet along Lot 3-A of Upper Kaimu Homesteads, Grant 6571 to K. Kamakani, Grant 6330 to S. Kamelamela and Grant 6328 to D. Kamelamela;
19.	53°	04'		10,520.90	feet along Government Lands;
20.	53°	31'	30"	9863.30	feet along Grant 9275 to H. M. Holt, et al., Trustees under the Will and of the Estate of James Campbell, Deceased;
21.	148°	00'		4100.00	feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
22.	116°	00'		8150.00	feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
23.	126°	59'		25,105.30	feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo to the point of beginning and containing an area of 16,843.891 acres, more or less.

BEING A PORTION OF THE LANDS ACQUIRED BY TRUSTEES' LIMITED WARRANTY DEED

GRANTOR: C.R. CHURCHILL, D.A. HEENAN, RICHARD W. GUSHMAN, II and RONALD J. ZLATOPER, the duly appointed, qualified and acting TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED

GRANTEE: THE TRUST FOR PUBLIC LAND, a California nonprofit public benefit corporation

DATED: July 11 2006
RECORDED: Document No. 2006- 129680

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EXHIBIT "B"

PERMITTED ENCUMBRANCES

1. Any lien for real property taxes not yet delinquent [Tax Map Key Nos. (3) 1-2-010-002 and 003].

2. AS TO PARCEL FIRST [TMK NO. (3) 1-2-010-002] ONLY:

   (A) Puna Forest Reserve as shown on the tax map.

   (B) The land has no recorded access to a public roadway.

3. AS TO PARCELS FIRST AND SECOND:

   (A) INSTRUMENT: LAND PATENT GRANT NUMBER S-15,666

   DATED: February 27, 1987

   The foregoing includes, but is not limited to, matters relating to reservation of minerals, water and prehistoric and historic remains.

   (B) FINAL JUDGMENT; EXHIBITS "A" AND "B"

   AGAINST: THE ESTATE OF JAMES CAMPBELL, DECEASED; W.H. MCVAY AND P.R. CASSIDAY, in their fiduciary capacity as Trustees under the Will and of the Estate of James Campbell

   IN FAVOR OF: PELE DEFENSE FUND

   DATED: August 26, 2002
   FILED: Circuit Court of the Third Circuit, State of Hawaii, 89-089, on August 26, 2002
   RECORDED: Document No. 2002-163259 on September 16, 2002

   (C) Claims arising out of customary and traditional rights and practices, including without limitation those exercised for subsistence, cultural, religious, access or gathering purposes, as provided for in the Hawaii Constitution or the Hawaii Revised Statutes.

(D) Discrepancies, conflicts in boundary lines, shortage in area, encroachments or any other matters which a correct survey or archaeological study would disclose.

(E) UNRECORDED LICENSE

LESSOR: C. R. CHURCHILL, D. A. HEENAN, RICHARD W. GUSHMAN, II, and RONALD J. ZLATOPER, Trustees under the Will and of the Estate of James Campbell, deceased

LESSEE: STATE OF HAWAII, Department of Land and Natural Resources

DATED: September 9, 1996, effective February 1, 1996

As amended by that certain unrecorded First Amendment of License dated as of December 13, 2005, of which a Memorandum of License dated as of December 13, 2005, recorded as Document No. 2005-256550.

PARTIAL ASSIGNMENT OF LICENSOR'S INTEREST IN LICENSE (OLSON) dated as of December 19, 2005 ("Effective Date"), recorded as Document No. 2006-010986, by and among C.R. CHURCHILL, D.A. HEENAN, RICHARD W. GUSHMAN, II and RONALD J. ZLATOPER, TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED (the "Licensor" or "Assignor"), THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES (the "Licensee"), and EDMUND C. OLSON, as Trustee of the EDMUND C OLSON TRUST NO. 2. under agreement dated August 21, 1985 ("Assignee") [AFFECT OTHER LANDS].

PARTIAL ASSIGNMENT OF LICENSOR'S INTEREST IN LICENSE (TPL) dated as of July 14, 2006, recorded as Document No. 2006-129682, by and among C.R. CHURCHILL, D.A. HEENAN, RICHARD W. GUSHMAN, II and RONALD J. ZLATOPER, TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED (the "Licensor" or "Assignor"), THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES (the "Licensee"), and THE TRUST FOR PUBLIC LAND, a California nonprofit public benefit corporation ("Assignee").

(F) The restrictions, covenants, reservations, limitations, conditions and agreements contained in the following:

INSTRUMENT: TRUSTEES' LIMITED WARRANTY DEED

DATED: July 11, 2006
RECORDED: Document No. 2006-129680

EXHIBIT C-1

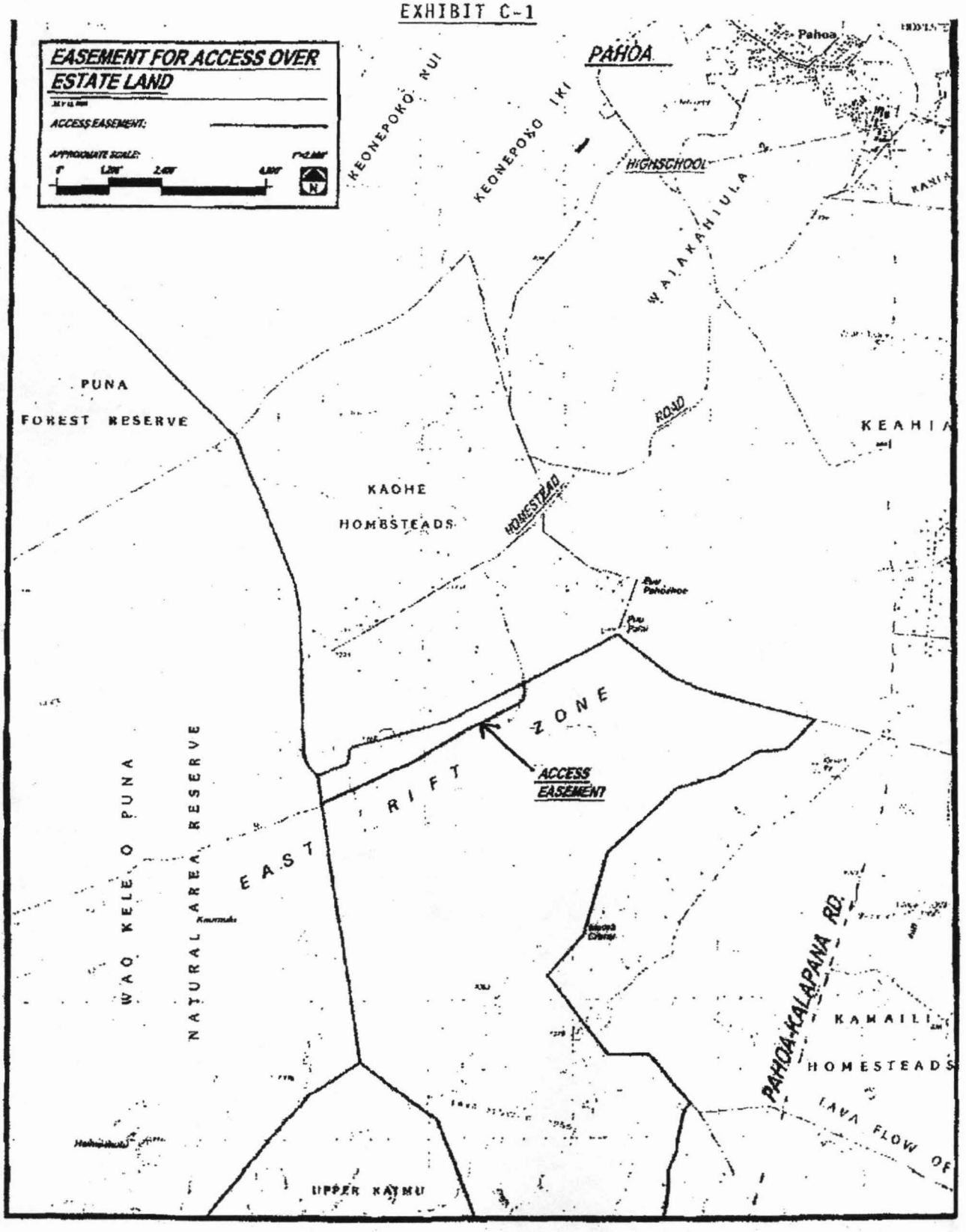
EASEMENT FOR ACCESS OVER ESTATE LAND
ACCESS EASEMENT:
APPROXIMATE SCALE:
PAHOA
KEONEPOKO NUI
KEONEPOKO IKI
HIGHSCHOOL
WAIAKAHIULA
ROAD
PUNA
FOREST RESERVE
KAOHE
HOMESTEADS
HOMESTEAD
KEAHIA
ACCESS EASEMENT
RIFT ZONE
EAST
WAO KELE O PUNA
NATURAL AREA RESERVE
PAHOA-KALAPANA RD.
KAMAILI
HOMESTEADS
LAVA FLOW OF
UPPER KAIMU

EXHIBIT C-2

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL C, same being portions of the Government Land of Kamaili, Kahena and Kikala (C.S.F No. 20,317 dated December 13, 1985), and thus bounded and described as per survey dated December 13, 1985, to wit:

Beginning at the east corner of this parcel of land, on the south boundary of Royal Patent 4475, Land Patent 8199, Land Commission Award 7713, Apana 13 to V. Kamamalu and at the north corner of Grant 7365 to J. K. Pau, the coordinates of said point of beginning referred to Government Survey Triangulation Station "KALIU" being 115.60 feet south and 9,325.70 feet west, thence running by azimuths measured clockwise from true South:

1.	46°	00'	982.00	feet along Grant 7365 to J. K. Pau;
2.	85°	00'	652.00	feet along Grant 7365 to J. K. Pau;
3.	58°	45'	1050.00	feet along Grant 7365 to J. K. Pau;
4.	73°	30'	1005.00	feet along Grant 7547 to Wm. K. Keliihoomalu;
5.	45°	46'	I197.50	feet along Grant 7547 to Wm. K. Keliihoomalu;
6.	139°	03'	50.08	feet along the north side of 50-Foot Road;
7.	45°	46'	1064.16	feet along the west side of 50-Foot Road;
8.	16°	10'	2051.31	feet along the west side of 50-Foot Road;
9.	38°	34'	1319.67	feet along the west side of 50-Foot Road;

10.	323°	16'		2381.65	feet along the south side of 50-Foot Road;
11.	270°	00'		981.59	feet along the south side of 50-Foot Road;
12.	316°	30'		1493.59	feet along the south side of 50-Foot Road to the northwest side of Upper Puna Road;
13.	Thence along the northwest side of Upper Puna Road, the direct azimuth and distance being:				
	27°	43'	20"	4458.54	feet;
14.	55°	41'	15"	171.71	feet along the northwest side of Upper Puna Road;
15.	Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 150.00 feet, the chord azimuth and distance being:				
	79°	01'	15"	118.82	feet;
16.	102°	21'	15"	518.59	feet along the northwest side of Upper Puna Road;
17.	Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 250.00 feet, the chord azimuth and distance being:				
	77°	01'	15"	213.94	feet;
18.	51°	41'	15"	284.74	feet along the northwest side of Upper Puna Road;
19.	Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 475.00 feet, the chord azimuth and distance being:				

	55°	01'	15"	55.24	feet;
20.	58°	21'	15"	354.39	feet along the northwest side of Upper Puna Road;
21.	Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 450.00 feet, the chord azimuth and distance being:				
	50°	46'	15"	118.77	feet;
22.	135°	50'		1250.91	feet along Grant 7731 to L. K. Swain;
23.	157°	30'		3467.50	feet along Grant 7593 to Louisa Swain, Grant 7478 to L. E. Blaisdell and the northwest end of 50-Foot Road;
24.	127°	35'		2173.00	feet along Lot III-B of Upper Kaimu Homesteads;
25.	172°	29'		6915.35	feet along Parcel B of Government Lands;
26.	258°	17'		139.94	feet along the south side of 20-Foot Road;
27.	244°	12'		614.60	feet along the south side of 20-Foot Road;
28.	195°	08'		397.80	feet along the south side of 20-Foot Road;
29.	254°	12'		783.69	feet along the south side of 20-Foot Road;
30.	254°	05'		1202.89	feet along the south side of 20-Foot Road;
31.	254°	48'		283.02	feet along the south side of 20-Foot Road;

1. Real Property Taxes have been fully paid up to and including June 30, 2006. (see tax statement attached)

Tax Key: (3) 1-2-010-001 Area Assessed: 1,930.000 acres

-Note:- Attention is invited to the fact that the premises covered herein may be subject to possible rollback or retroactive property taxes.

2. Any trails or rights-of-way, claims to which may be predicated upon prescriptive use or ancient Hawaiian use or custom.

3. The terms and provisions contained in the following:

INSTRUMENT : LAND PATENT GRANT NUMBER S-15,666

DATED : February 27, 1987

The foregoing includes, but is not limited to, matters relating to reservation of minerals, water and prehistoric and historic remains.

4. FINAL JUDGMENT; EXHIBITS "A" AND "B"

AGAINST : THE ESTATE OF JAMES CAMPBELL, DECEASED; W.H. MCVAY AND P.R. CASSIDAY, in their fiduciary capacity as Trustees under the Will and the Estate of James Campbell

IN FAVOR OF: PELE DEFENSE FUND

DATED : August 26, 2002
FILED : Circuit Court of the Third Circuit, State of Hawaii, Civil No. 89-089 (Hilo), on August 26, 2002
RECORDED : Document No. 2002-163259 on September 16, 2002

5. UNRECORDED LICENSE

LICENSOR : TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED

LICENSEE : STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES

DATED : September 9, 1996

As amended by the certain unrecorded First Amendment of License dated as of December 13, 2005, of which a Memorandum of License dated as of December 13, 2005, recorded as Document No. 2005-256550.

PARTIAL ASSIGNMENT OF LICENSOR'S INTEREST IN LICENSE (OLSON) dated as of December 19, 2005 ("Effective Date"), recorded as Document No. 2006-010986, by and among the TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED, acting in their fiduciary and not in their individual capacities ("Licensor" or "Assignor"), THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES ("Licensee"), and EDMUND C. OLSON, as Trustee of the EDMUND C. OLSON TRUST NO. 2 under agreement dated August 21, 1985 ("Assignee").

6. The terms and provisions contained in the following:

INSTRUMENT : *TRUSTEES' LIMITED WARRANTY DEED WITH COVENANTS*

DATED : ----- (acknowledged December 20, 2005)
RECORDED : Document No. 2006-010985

The foregoing includes, but is not limited to, matters relating to Grantor's reserved right of a perpetual nonexclusive access (vehicular and pedestrian) easement.

7. Claims arising out of customary and traditional rights and practices, including without limitation those exercised for subsistence, cultural, religious, access or gathering purposes, as provided for in the Hawaii Constitution or the Hawaii Revised Statutes.

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32.	242°	35'	876.64	feet along the south side of 20-Foot Road;
33.	245°	28'	581.05	feet along the south side of 20-Foot Road;
34.	242°	17'	539.85	feet along the south side of 20-Foot Road;
35.	246°	20'	20.81	feet along the south side of 20-Foot Road;
36.	240°	31'	1658.87	feet along the south side of 20-Foot Road;
37.	240°	47'	707.62	feet along the south side of 20-Foot Road;
38.	309°	05'	1550.70	feet along R. P. 4475, R. P. 6883, L. P. 8200, L. C. Aw. 7713, Ap. 14 to V. Kamamalu;
39.	296°	22'	753.00	feet along R. P. 4475, R. P. 6883, L. P. 8200, L. C. Aw. 7713, Ap. 14 to V. Kamamalu;
40.	286°	00'	2750.00	feet along R. P. 4475, L. P. 8199, L. C. Aw. 7713, Ap. 13 to V. Kamamalu to the point of beginning and containing an area of 1,930 acres, more or less.

ORIGINAL

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF LAND AND NATURAL RESOURCES, STATE OF HAWAI'I AND THE OFFICE OF HAWAIIAN AFFAIRS

I. INTRODUCTION

This Memorandum of Agreement ("Agreement") is entered into by and between the Department of Land and Natural Resources of the State of Hawai'i (the "Department"), by and through the Board of Land and Natural Resources (the "Board"), and the Office of Hawaiian Affairs ("OHA"). The term "DLNR" shall mean the Department, the Board, or both as the context requires. DLNR and OHA are collectively referred to as the Parties.

This Agreement is designed to promote increased understanding, cooperation, interaction, and to provide basic principles and guidelines for further negotiations on issues of mutual concern.

OHA has entered into an Agreement of Sale with The Trust for Public Lands ("TPL"), a California nonprofit public benefit corporation to purchase that certain real property known as Wao Kele O Puna, (Tax Map Keys: 1-2-10-2 and 1-2-10-3, respectively), consisting of approximately 25,855.891 acres, situated in Puna, Island and County of Hawai'i, State of Hawai'i (the Property), more particularly described in Exhibit "A" attached hereto.

The Parties wish to work together to provide proper management of the Property and to develop OHA's own capacity to manage lands independently from DLNR. The Parties further wish to preserve the Property's natural and cultural resources and maintain traditional and customary practices on the Property through appropriate resource management.

As discussed herein, DLNR will bear initial management responsibility as soon as the Property is designated as a forest reserve. However, management responsibility will be turned over to OHA as OHA acquires capacity, experience and expertise in land management.

II. TERMS

Subject to the conditions identified in part III below, the Parties agree as follows:

1. Purchase of the Property. OHA will purchase the Property with funding from the USDA Forest Service Forest Legacy Program and OHA. The exact funding levels are not known at this time but are expected to be approximately $3.4 million from the Forest Legacy Program with the balance to be paid by OHA. No DLNR funds will be used for the purchase.

2. Title. Title to the Property will be held in fee by OHA pursuant to authority created by Article XII of the State Constitution and Haw. Rev. Stat. § 10-4 (Cum. Supp. 2004) and Haw. Rev. Stat. § 10-5 (Cum. Supp. 2004).

3. Forest Reserve Designation. The Parties will cooperate in designating the Property as a forest reserve pursuant to Haw. Rev. Stat. chapter 183. The designation process shall commence as soon as possible and shall proceed as expeditiously as is possible under applicable law. Notwithstanding any other provision herein, DLNR or OHA may develop and improve the Property though plantings and erosion control and may construct such improvements as may be agreed herein or otherwise.

4. Compliance with Federal Grant Requirements. Management, use, and future disposition of the Property shall comply with all applicable U.S.D.A. Forest Legacy Federal Grant requirements and with applicable United States Department of Agriculture ("USDA") Forest Service Forest Legacy Program Guidelines (the "Guidelines"), until such time as the grant requirements and/or the Guidelines no longer apply or OHA is released of its federal grant obligations by the Forest Service/ Forest Legacy Program, other federal governing agency, or through an Act of the U.S. Congress. A copy of the Guidelines is attached as Exhibit "B".

5. Compliance with State Forest Reserve Requirements. Management, use, and future disposition of the Property shall comply with all applicable State of Hawai'i laws, rules, and regulations governing and relating to forest reserves as described in Haw. Rev. Stat. chapter 183 until such time as the Property is no longer held or designated as forest reserve property. In the event of conflict between requirements of federal and state law, federal law shall govern pursuant to Haw. Rev. Stat. § 29-15 (1993).

Use of the Property will also comply with the Findings of Fact and Conclusions of Law and Final Declaratory Judgment/Injunction issued on August 26, 2002 in *Pele Defense Fund vs. The Estate of James Campbell, Deceased et. al*, Civil No. 89-089, (the "PDF Final Judgment"), a true and correct copy of which is attached as Exhibit "C," except that no other statement herein, in the Plan, or in the PDF Final Judgment shall override or supercede the requirements of federal or state law, (including case law and regulations) relating to undeveloped real property.

6. Management Responsibility. As more fully described below, the Parties intend to develop a Comprehensive Management Plan (the "Plan") based upon the terms of this Agreement. All management and maintenance responsibilities and practices will conform with mutually agreed upon requirements set forth in therein.

All provisions of the Plan will be subject to the availability of funding.

Once the Property is designated as forest reserve (but not before), DLNR shall bear the primary responsibility for the management and maintenance of the Property for up to ten years after the signing of this Agreement or until such time as the Parties determine and agree that OHA is capable of assuming management responsibilities required by the Plan, whichever time is shorter.

7. Timeline. The Parties will make a good faith effort to complete the following in three (3) years: (a) develop the Plan, (b) plug and abandon the geothermal well located on the Property, (c) seek funding from other sources to assist with the management costs of the Property, and (d) remove the Geothermal Resource Subzone designation as discussed below in paragraph 16. Status reports concerning management issues, transfer of expertise, and property maintenance will be presented to and considered by the OHA board and the Board at least annually. Appropriate changes to the assignment of duties (primarily from DLNR to OHA), funding levels, management, and enforcement of regulations related to the Property may be made upon mutual agreement between the Parties.

8. Assumption of Management Responsibilities/Transfer of Knowledge. Transfer of management responsibility shall follow the Plan guidelines. The Plan shall define how over time the Parties will share responsibility for management of the Property, provided that full management responsibilities of the Plan shall be relinquished by DLNR and transferred to OHA within ten years of the signing of this Agreement.

OHA and DLNR shall each designate a person to act as liaison for transition of enforcement responsibilities and begin work on transition of responsibilities. The duties of each such person will include, but not be limited to, responsibility for general coordination of all Property activities, development of the Plan, seeking funding from the State Legislature and/or from external sources, seeking the support of the County of Hawai'i, implementing management activities, facilitating the transfer of knowledge from DLNR to OHA pertaining to land ownership and management, undertaking the necessary duties to change the Property designation to a forest reserve, and supervising public hearings and meetings. Additionally, OHA and DLNR shall each designate a person to act as liaison for transition of enforcement

responsibilities, development and implementation of transition plan and coordinating enforcement of applicable regulations.

9. Revocation. Upon agreement by the parties, DLNR shall cooperate with OHA to seek a revocation or suspension of designation as a forest reserve in the manner provided by law.

10. Interim Plan. Prior to closing of OHA's purchase of the Property, the Parties shall develop an interim management plan for submission to the Forest Legacy Program. The interim plan shall provide guidelines for the management and protection of the property by the Parties, as funds and capacity permit, until such time as the property is designated a forest reserve and until such time as the Comprehensive Management Plan can be implemented.

11. Comprehensive Management Plan. Upon execution of this Agreement, the Parties agree to develop the Plan for the Property. The Parties shall form an advisory council for the development of the management plan consisting of the Pele Defense Fund and other interested community members mutually selected by DLNR and OHA. The cost of developing the Plan shall be funded as provided in paragraph 15 below.

The Plan shall be developed according to the following conditions and may contain such other terms and conditions agreed to by the Parties:

a. *Assessment.* The Plan shall include an inventory and assessment of natural and cultural resources, historic sites, risks, threats to resources, interpretive values, and economic development potential. The section on economic development potential shall identify those uses consistent with: status as a forest reserve, the protection of traditional and customary uses of the site, sustainable use and protection of the resources of the site, and the terms of the Forest Legacy Program funding.

b. *Existing Improvements.* Subject to the availability of funding and identification as a priority action under the Plan, management of the Property shall include maintenance and repair of existing roads and historical sites on the Property.

c. *Allowable Uses of Property.* Subject to requirements of state law applicable to forest reserves, to any other applicable state law, to any applicable requirements of the Forest Legacy Program, and to future revision by the Parties, allowable uses of the Property shall include but are not limited to the following:

(1) Public Access. Public Access shall be allowed to the extent required by federal and state law and the Guidelines. Public access beyond that required by law and the Guidelines will be determined by the Parties based on a comprehensive inventory of the Property, which will identify and assess the access points, the natural and cultural resources, the historic sites, the risks, the threats to resources, and the interpretive values.

(2) Cultural, natural resources, open space and recreational use. The general use of the Property shall be for cultural, natural resource, and open space purposes. Passive recreational or educational purposes that require neither surface alteration subject to the local grading ordinance nor other development of the land may be permitted unless specifically excluded by the Plan. The Plan may, but need not, allow development of recreational use infrastructure and facilities such as trails, access roads, parking, fencing, cultural and environmental education facilities (e.g. kiosks).

(3) Preservation of Plant and Wildlife Habitat. The Parties will protect and enhance native plant and wildlife habitat, the natural, scenic and open-space nature of the Property.

(4) Traditional Hunting and Gathering Practices. Wildlife hunting not

prohibited by applicable laws or regulations may be permitted, if it is conducted in a manner that does not significantly deplete native wildlife resources or damage the ecology of the Property. Traditional hunting and gathering practices shall be governed in accordance with federal and state law, the Guidelines, and the PDF Final Judgment.

(5) Water. Subject to written approval from OHA and DLNR, exploration or extraction of water resources and any activity associated therewith, with the exception of water needed for management practices agreed upon in the management plan may be permitted as long as there is no damage to natural resources, existing forests, or soils.

d. *Prohibited Uses.* The following "non-forest uses" as defined by the Forest Legacy Program are uses of the land inconsistent with maintaining forest cover and shall be prohibited on the Property.

(1) Mineral Extraction. Any exploration or extraction of oil, gas, minerals, steam, hydrocarbons, soil, sands, gravel or other material on or beneath the Property for the purpose of exporting these materials/resources off the Property shall be prohibited.

(2) Grading and Excavation. Alteration of landforms by grading or excavation of topsoil, earth, or rock, inconsistent with Forest Legacy Program guidelines shall be prohibited. Alteration of landforms necessary or appropriate for appropriate public access, cultural restoration or wildlife or forest management, or emergency purposes (such as fire fighting) and in keeping with good natural resource management practices shall not be prohibited.

(3) Subdividing Land. The division, subdivision, partition, or de facto subdivision of the Property inconsistent with the Forest Legacy Program guidelines shall be prohibited. However, this paragraph does not prohibit the lease, license, or other temporary

disposition of a portion of the Property or a voluntary conveyance to a governmental or nonprofit entity for conservation or public access purposes.

(4) Commercial and Industrial Uses. The establishment of any commercial or industrial uses inconsistent with the Forest Legacy Program Guidelines shall be prohibited.

(5) Signage. The construction, placement, or erection of any sign or billboards, excepting signs necessary for management purposes or to control unauthorized or dangerous activities, or signs, appropriately placed, that acknowledge the financial support of donors in the purchase of the Property shall be prohibited.

A preliminary investigation of potential access and trail routes will be conducted to consider exposure to specific dangerous natural conditions. It is the intent of the Parties to examine using the warning sign design and placement process pursuant to Act 82 SLH 2003, and the ancillary Title 13, Chapter 8 Hawai'i Administrative Rules as appropriate.

(6) Storage of Waste. The storage, dumping or accumulation of trash, garbage, or waste on the Property shall be prohibited.

(7) Exotic Plants or Animals. The introduction of invasive exotic animals or plants that would alter or impair the conservation values of the Property shall be prohibited.

12. License Agreement. On September 9, 1996, the Campbell Estate entered into a well monitoring license agreement with the DLNR, which license covers and affects the property. Unless otherwise agreed, all rights and obligations that exist pursuant to the License Agreement (as amended) shall remain unaffected by this Agreement.

13. Plugging and Abandonment. The Parties shall work together to secure funding for plugging and abandonment of the existing geothermal well shaft on the Property. The

Parties shall make reasonable and diligent efforts to plug and abandon the existing geothermal well site on the Property within three years after acquisition of the Property by OHA. To facilitate the plugging of the well in an expedient manner, the Parties agree to the following:

a. *Legislative Funding.* The Parties shall work cooperatively to secure funding from the State Legislature during the 2006 legislative session for the DLNR to plug, and abandon the well. DLNR agrees to seek funding in subsequent legislative sessions as necessary

b. The Parties shall work cooperatively to seek appropriate federal funding for plugging and abandonment of the well. The Parties realize and acknowledge, however, that such funds are not presently available.

c. *Alternative Funding Agreement.* If parts a. and b. immediately above do not adequately cover the costs of plugging and abandonment, OHA agrees to seek OHA board approval to cost-share up to TWENTY PERCENT (20%) of the total project costs of plugging and abandonment of the well. The Parties shall encourage the County of Hawai'i to partner in the effort to plug and abandon the well and to cost-share up to THIRTY PERCENT (30%) of the total project costs.

14. Additional Resource-Management Funding. The Parties shall work cooperatively and in good faith to secure specific funding for natural and cultural resource management and enforcement on the property.

15. Management Funding. For each year during which DLNR continues to manage the Property (that is, until management responsibility is turned over to OHA as contemplated herein), OHA shall transfer to DLNR up to TWO HUNDRED TWENTY EIGHT THOUSAND AND NO/100 DOLLARS ($228,000.00) for the development of the Plan, management of the Property, and for protection and enforcement actions on the Property. By

April 1 of each year during which DLNR continues to manage the property, OHA will make a good faith effort to determine the amount of funding to be transferred to DLNR for its use during the next fiscal year. The amount of funds transferred will determine the level of management and protection that is implemented. The said amount is to be expended as agreed by the Parties. Subject to appropriation and allotment, DLNR will contribute up to ONE HUNDRED THOUSAND AND NO/100 DOLLARS ($100,000.00) annually either in appropriated funds (obtained from various sources) or through in-kind expenditures from existing resources, volunteer efforts, and/or budgets for the development of the Plan and management of the property, by providing the liaison person described above, or by providing on site management capacity, transfer of knowledge and active management practices. An estimated budget for illustration purposes only is shown in Exhibit "D."

At least quarterly, DLNR shall provide to OHA an expenditure report, which provides a description of expenditures made during the prior quarter as well as a summation of quarterly expenditures and cumulative expenditures to date. The report should provide a description of each expenditure, identify the amount expended and identify whether the expenditure was an in-kind expenditure or from appropriated OHA or DLNR funds. DLNR shall also report to OHA the assigned DAGS number for all assets including property, plant and equipment that are acquired with OHA funds. Upon complete transfer of the management duties to OHA as contemplated herein, DLNR shall transfer assets purchased with OHA funds to OHA.

16. Geothermal Subzone Designation Removal. The Parties shall work together to remove the Geothermal Resource Subzone designation specified under Haw. Rev. Stat. § 205-5.1 (2001) and Haw. Rev. Stat. § 205-5.2 (2001), from the Property.

17. If any of the terms identified above are deemed unachievable, unfeasible, impractical, or not viable for any reason, the Parties agree in good faith to cooperate and work together to find alternate feasible and acceptable terms that will facilitate the intended goals.

18. The Parties agree in good faith to cooperate with each other to accomplish the intended goals identified above. Cooperation includes, but is not limited to, providing copies or access to documents referenced in this Agreement, providing copies of or access to other relevant documents, and providing information that may facilitate the intended management transfer.

III. CONDITIONS

1. Governing Law. This Agreement shall be governed by the laws of the State of Hawai'i.

2. Amendments. This Agreement may be amended only by the written agreement of the parties hereto.

3. Costs. Except as otherwise provided or agreed, each party shall bear its own costs and expenses relating to this Agreement and the Property.

4. Binding Effect. Upon execution of this Agreement by both Parties, the Parties shall cooperate and negotiate in good faith conditions and terms to complete and execute the definitive documents and instruments necessary to accomplish the intended goals. Terms and conditions of any future agreement shall be consistent with this Agreement and upon such other terms as the Parties shall agree.

The foregoing accurately reflects the Agreement between the Parties. We indicate our acceptance of this document and the agreement herein by executing this Agreement.

OFFICE OF HAWAIIAN AFFAIRS

Date 6-27-06.

By _____
CLYDE W. NĀMU'O
Its Administrator

BOARD OF LAND AND NATURAL RESOURCES

Date 6-27-06

By _____
PETER T. YOUNG
Its Chairperson

APPROVED AS TO FORM:

_____
Ernest M. Kimoto, Senior Staff Attorney
Office of Hawaiian Affairs

Date: June 27, 2006

APPROVED AS TO FORM:

_____
Deputy Attorney General

Date: 6/27/06

EXHIBIT "A"
Legal Description of the Wao Kele o puna PROPERTY

-PARCEL ONE:-

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL A, same being portions of the Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F No. 20,315 dated December 13, 1985), and thus bounded and described as per survey of Raymond S. Nakamura, Land Surveyor, with the Survey Division, Department:

Beginning at the west corner of this parcel of land and on the south boundary of Land Court Application 1053, the coordinates of said point beginning referred to Government Survey Triangulation Station "OLAA" being 47,769.67 feet South and 8,228.41 feet West, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	24,288.19	feet along Land Court Application 1053;
2.	345°	23'	30"	1,348.57	feet along the remainder of Government Lands;
3.	313°	00'		1,221.60	feet along the remainder of Government Lands;
4.	330°	16'		4,682.10	feet along the remainder of Government Lands;
5.	262°	03'		1,960.70	feet along the remainder of Government Lands;
6.	290°	02'		627.40	feet along the remainder of Government Lands;
7.	314°	28'		4,581.80	feet along the remainder of Government Lands;
8.	314°	47'		744.40	feet along the remainder of Government Lands;
9.	314°	12'		735.30	feet along the remainder of Government Lands;
10.	315°	31'		1,825.53	feet along the remainder of Government Lands;
11.	40°	41'		13.81	feet along the north side of 20-Foot Road;
12.	338°	15'		14.99	feet along the west side of 20-Foot Road;
13.	60°	05'	12"	25,840.22	feet along Parcel B of Government Lands;
14.	140°	23'		16,220.18	feet along Parcel B of Government Lands to the point of beginning and containing an area of 9,012 acres, more or less.

-PARCEL TWO:-

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL B, same being portions of Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F. No. 20,316 dated December 13, 1985), and thus bounded and described as per survey of Raymond S. Nakamura, Land Surveyor, with the Survey Division, Department:

Beginning at the west corner of this parcel of land and at an angle on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 55,748.70 feet South and 22,096.90 feet West, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	16,000.00	feet along Land Court Application 1053;
2.	320°	23'		16,220.18	feet along Parcel A of Government ands;
3.	240°	05'	12"	25,840.22	feet along Parcel A of Government ands;
4.	338°	15'		3,262.76	feet along the west side of the 20-Foot Road;
5.	340°	23'		19.26	feet along the west side of the 20-Foot Road;
6.	342°	31'		250.51	feet along the west side of the 20-Foot Road;
7.	337°	27'		156.17	feet along the west side of the 20-Foot Road;
8.	347°	14'		271.04	feet along the west side of the 20-Foot Road;
9.	348°	38'		331.85	feet along the west side of the 20-Foot Road;
10.	353°	51'		125.10	feet along the west side of the 20-Foot Road;
11.	359°	30'		1,278.10	feet along the west side of the 20- Foot Road;
12.	358°	59'		2,128.77	feet along the west side of the 20- Foot Road;
13.	332°	38'		221.69	feet along the west side of the 20-Foot Road;
14.	315°	33'		287.92	feet along the west side of the 20-Foot Road;
15.	258°	17'		9.45	feet along the south side of the 20-Foot Road;
16.	352°	29'		6,915.35	feet along Parcel C of Government Lands;
17.	56°	27'		1,460.60	feet along Lots 3-B and 3-A of Upper Kaimu Homesteads;

18. 39° 38' 3,534.10 feet along Lot 3-A of Upper Kaimu Homesteads, Grant 6571 to K. Kamakani, Grant 6330 to S. Kamelamela and Grant 6328 to D. Kamelamela;

19. 53° 04' 10,520.90 feet along Government Lands;

20. 53° 31' 30" 9,863.30 feet along Grant 9275 to H. M. Holt, et al., Trustees under the Will and of the Estate of James Campbell, Deceased;

21. 148° 00' 4,100.00 feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;

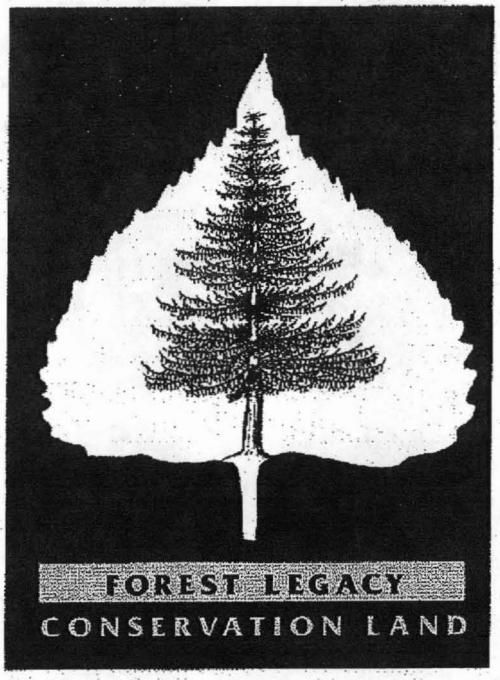
22. 116° 00' 8,150.00 feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;

23. 126° 59' 25,105.30 feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo to the point of beginning and containing an area of 16,843.891 acres, more or less.

EXHIBIT "B"

FINAL

Forest Legacy Program Implementation Guidelines



June 30, 2003

EXHIBIT "B"

USDA Forest Service State & Private Forestry Cooperative Forestry
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INTRODUCTION

The Cooperative Forestry Assistance Act (CFAA) of 1978, as amended, (16 U.S.C. 2101 et. seq.) recognizes that the majority of the Nation's productive forest lands are in private ownership; that private landowners are facing increased pressure to convert their forest lands to other uses; that greater population density, user demands and restrictions on Federal and other public lands are placing increased pressures on private lands to provide a wide variety of products and services from working forests including timber and other forest commodities, fish and wildlife habitat, watershed function and water supply, aesthetic qualities, historical and cultural resources, and recreational opportunities; and that good stewardship of privately held forest lands requires a long-term commitment that can be fostered through a partnership of Federal, State, local government and individual efforts.

In 1990, the Forest Legacy Program (FLP) was established to promote the long-term integrity of forestlands. The Secretary was directed to establish the FLP in cooperation with State, regional, and other units of government. In carrying out this mandate, the Secretary of Agriculture is authorized to acquire lands and interests in lands in perpetuity for inclusion in the FLP. Landowner participation in the FLP, including the sale of lands and interests in lands, is entirely voluntary. The Program is implemented through State participation, consistent with these National FLP guidelines, and as described in each State Assessment of Need. The FLP goals and objectives are accomplished through Forest Service (FS) cooperation with State partners, Federal agencies, local units of government, forest landowners and other partners. The FLP identifies and protects environmentally important private forestlands that are threatened by conversion to nonforest uses and provides the opportunity for continuation of traditional forest uses, such forest management activities and outdoor recreation.

The guidelines are organized in three parts:

PART 1 - General Program Guidelines: Program direction applicable to all aspects of the FLP.

PART 2 - State Grant Program Guidelines: Program direction applicable to States and Forest Service (FS) Regions/Area/IITF where a State has elected the State grant option and where ownership of lands or interests in lands is vested in a State or subdivision of a State.

PART 3 - Federal Acquisition Program Guidelines: Program direction applicable to States and FS Regions/Area/IITF selecting the Federal acquisition and ownership process, where ownership of lands or interests in lands is vested in the United States (U.S.).

EXHIBIT "B"

PART 1 - GENERAL PROGRAM GUIDELINES

I. Authority and Purpose of the Forest Legacy Program (FLP)

A. Authority The Cooperative Forestry Assistance Act (CFAA) of 1978, as amended, (16 U.S.C. 2101 et. seq.) provides authority for the U.S. Secretary of Agriculture (Secretary) to provide financial, technical, educational, and related assistance to States, communities, and private forest landowners. Section 1217 of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (P.L. 101-624:104 stat.3359; 16 U.S.C. 2103c), also referred to as the 1990 Farm Bill, amended the CFAA and directs the Secretary to establish the FLP to protect environmentally important forest areas that are threatened by conversion to nonforest uses. This authority continues indefinitely. Through the 1996 Farm Bill (Federal Agricultural Improvement and Reform Act of 1996; P.L. 104-127; Title III - Conservation; Subtitle G - Forestry; Section 374, Optional State Grants for Forest Legacy Program), the Secretary is authorized, at the request of a participating State, to make a grant to the State to carry out the FLP in that State, including the acquisition by the State of lands and interests in lands.

B. Purpose of the Forest Legacy Program The purpose of the FLP is to ascertain and protect environmentally important forest areas that are threatened by conversion to nonforest uses.

FLP seeks to promote forestland protection and other conservation opportunities. Such purposes shall include the protection of important scenic, cultural, fish, wildlife and recreational resources, riparian areas and other ecological values. Traditional forest uses, including timber management, as well as hunting, fishing, hiking, and similar recreational uses are consistent with purposes of the FLP. Both purchased and donated lands and interests in lands through the use of conservation easements and fee-simple purchase are used to acquire forested land meeting Forest Legacy purposes from willing sellers or donors.

C. Delegations of Authority The Secretary has delegated authority to administer all aspects of the FLP to the Under Secretary for Natural Resources and Environment (7 CFR 2.20(a)(2)(xvi)) who in turn has delegated the authority to the Chief of the Forest Service (7 CFR 2.60(a)(16). Delegations only apply within the U.S. Department of Agriculture and its agencies. The role of State and Regional programs, and the right of States to elect the State Grant Option, are contained in the authorizing statute and these program implementation guidelines.

II. Description of Terms and Abbreviations

Assessment of Need (AON) is a document produced by a State, or a federally recognized Indian Tribe, in consultation with the State Forest Stewardship Coordinating Committee (SFSCC). The AON contains the an assessment of the forests and forest

uses, a description of forces that are converting forests to nonforest uses, describes Eligibility Criteria developed by the State to identify important forest areas to be proposed as Forest Legacy Areas (FLA), and acts as a guide to implementation of FLP in the State.
Assessment of Need (AON) Amendment is a document produced by a State to amend their AON, to add or delete Forest Legacy Areas (FLA), or to modify the Eligibility Criteria.

CFAA is the Cooperative Forestry Assistance Act of 1978, P.L. 95-313, 92 stat. 365, 16 U.S.C., 2101 et seq. (as amended through P.L. 107-195, June 16, 2002).

Conservation Easement is a legal agreement a property owner makes with a governmental entity or a nonprofit organization to restrict activities allowed on the land in order to protect specified conservation values. Easement restrictions are tailored to the particular property and to the interests of the individual landowner. All FLP conservation easements are held in perpetuity.

Eligibility Criteria are a set of factors developed by the State lead agency, in consultation with the State Forest Stewardship Coordinating Committee (SFSCC), to evaluate geographic areas to determine if they contain significant environmental values to be considered an 'important forest area' and contain "threats" of conversion to be eligible as a Forest Legacy Area (FLA).

Federal Appraisal Standards are those standards contained in the publication entitled "Uniform Appraisal Standards for Federal Land Acquisitions: Interagency Land Acquisition Conference, 2000," or subsequent amendments or updates. These standards are available for purchase from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 204029328 (ISBN 0-16-038050-2) or online at http://www.usdoj.gov/enrd/land-ack/

Forest Legacy Area (FLA) is a geographic area with important forest and environmental values, that satisfies identified Eligibility Criteria and has been delineated, described, and mapped in a State's AON for the FLP. Acquisition of lands and interests in lands for the FLP can only occur within approved FLAs.

Forest Legacy Area (FLA) Boundary Adjustment is a minor change to an existing FLA to create a more logical or manageable boundary.

Forest Legacy Program (FLP) Project is an individual or series of land or interest in land acquisition transaction(s). The transaction(s) can be on an individual tract or multiple tracts in a distinct geographical area. A FLP project relates to a single funding event in a given fiscal year. FLP projects can have a single parcel that can be completed at one closing or more than one parcel that can be completed in a succession of closings. If a successive FLP project is proposed on a parcel or in a distinct geographic area each transaction is treated as an independent unit in the project selection process and funding is not guaranteed.

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Forest Service (FS) is the United States Department of Agriculture Forest Service.

Forest Service Region/Area/IITF refers to the field units of the Forest Service responsible for FLP management and oversight within the Forest Service Regions, Northeastern Area (Area) or International Institute of Tropical Forestry (IITF).

Forest Stewardship Plans, or multi-resource management plans, are prepared with the purpose of achieving long-term stewardship of forestland. Such plans identify landowner objectives and describe actions to protect and manage soil, water, range, aesthetic quality, recreation, timber, and fish and wildlife resources, and other conservation values identified on the tract. Plans are to be prepared by a professional resource manager. A Forest Stewardship Plan that meets the requirements of the Forest Stewardship Program or a multi-resource management plan is required for FLP qualification. The State Forester or equivalent, or their designee must approve the plan. (See Appendix F for sample content of a Forest Stewardship Plan).

Full Fee Purchase is a land conveyance where a purchaser acquires all rights, title and interest in a property from a seller or owner. It is also known as fee simple or fee acquisition.

Geographic Regions are the collection of States that makeup the National Association of State Foresters (NASF) Regions. The three regions are: North (consisting of the States within the FS Northeastern Area), South (consisting of all the States within the FS Southern Region, and the Territories of the International Institute of Tropical Forestry), and the West (consisting of all the States within the FS Northern, Rocky Mountain, Intermountain, Southwestern, Pacific Southwest (including the Commonwealth of the Northern Mariana Islands, Guam and American Samoa), Pacific Northwest and Alaska Regions. (See Appendix B for a map of the Forest Service's Regions/Area/IITF)

Indirect costs relate to costs of the management and administration of the FLP. Indirect costs, unlike salary, which is a direct cost, are defined as costs not readily assignable to a specific legacy acquisition. (See OMB Circular A-87, "Cost Principles for State, Local, and Indian Tribal Governments," for a description of indirect and direct costs).

In-kind contributions are non-cash contributions, including third-party contributions. In-kind contributions must be expenses necessary to accomplish program activities, and allowable if the Federal Government were required to pay for them. (See Appendix C for applicable OMB Circulars)

Interests in Land are a right, claim, or legal share in real property that are less than the full title.

Land Trust is a nonprofit organization, as described in 501(c) of the Internal Revenue Code of 1986, that protects land by working with landowners who wish to donate or sell fee title or conservation easements to maintain conservation values associated with the land.

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Market Value is the amount in cash, or in terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desires but is not obligated to buy. (*Uniform Appraisal Standards for Federal Land Acquisitions: Interagency Land Acquisition Conference*, 2000, p.4.)

Multi-State Entity is a government-established organization involving two or more States or Indian tribes whose jurisdiction encompasses all or portions of the land area of an FLA(s).

National Association of State Foresters (NASF) is the organization representing State forestry organizations in all 50 States, the territories and the District of Columbia. Nonfederal Cost Share refers the nonfederal cost-share required to receive FLP funding. There are three main categories of activities that meet this requirement: 1) the value of land, or interests in land, dedicated to the FLP that is not paid for by the Federal government, 2) nonfederal costs associated with program implementation, and 3) other nonfederal costs associated with a grant or other agreement which meets FLP purposes. The nonfederal cost-share must be documented, and in the case of a grant, must meet the timing, terms and conditions of the grant.

Nonforest Uses-

Noncompatible -nonforest uses are uses of the land inconsistent with maintaining forest cover including, but not limited to, activities that result in extensive surface disturbance such as residential subdivisions, commercial development, and mining. These uses generally should be excluded from FLP conservation easements or land purchases. FLP funds should only be used on parcels with forestland as defined in the State's AON.

Compatible - nonforest uses are nonforest uses of the land that may be compatible with forest uses as part of an undeveloped landscape, including cultivated farmland, pasture, grassland, shrubland, open water, and wetlands. These nonforest uses should be less than 25 percent of the total area. Forest Legacy funds should only be used on parcels with forestland as defined in a State's AON. Other funding sources may be used to protect nonforested areas on those parcels with less than the minimum required forest cover.

Nontrust Allotment Lands are privately owned fee simple lands owned by tribal members and if they are forested, are eligible for the FLP when they are located within an approved FLA. Trust lands and reservations are already protected through the trust relationship between the U.S. Department of the Interior and the tribe and are ineligible for the FLP.

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Pass-through describes a land transaction whereby a third party, such as a land trust, acquires interests in lands with the intent to convey such interests to a unit of government. The transaction can include a full or partial donation, or sale at market value.

Payment in Lieu of Taxes (PILT) is made by tax-exempt entities, including the Federal government, to compensate local jurisdictions for tax revenues foregone as a result of ownership by a tax-exempt owner. Any FLP tract acquired in fee and held by the FS is eligible for PILT payments (entitlement land as defined at 31 U.S.C. 6901). Federal funds for PILT are not authorized for any land or interests in land held by nonfederal entities, or for conservation easements held by the United States.

Program Funds are FLP funds that are appropriated by Congress and allocated by the FS to three categories: Project funds, Administrations funds, and AON Preparation funds.

Project Evaluation Criteria are developed by the States, in consultation with the State Forest Stewardship Coordinating Committees (SFSCC), to evaluate the eligible tracts submitted by interested landowners for inclusion in the FLP.
Relocation refers to the provision in the Uniform Relocation Assistance and Real Estate Property Acquisition Policies Act of 1970 (PL 91-646 or 42 U.S.C. 4601) which requires Federal agencies and programs to pay for the relocation of a person displaced by a federally funded real estate transaction.

Reserved Areas are designated areas where nonforest uses (e.g. house, barn, remote recreation camps, etc.) are or will be allowed, but are inseparable from the land holding and do not have a detrimental effect on the conservation easement values. These areas shall be defined and described in the conservation easement and may be restricted in terms of their use, or provisions made through cost and time to cure and treatment. To the extent possible these areas of noncompliance should be excluded from the FLP project.

Reserved Interest Deed is where the grantee (government) acquires all rights, titles, and interests in a property, except those rights, titles, and interests that may run with the land that are expressly reserved by a grantor (landowner).

Secretary is the U.S. Secretary of Agriculture.

State refers to any of the 50 States, Puerto Rico, Guam, the United States Virgin Islands, the Commonwealth of the Mariana Islands, and American Samoa participating in the FLP.

State Forest Stewardship Coordinating Committees (SFSCC) are defined, and their duties are described, in Section 19(b) of the CFAA (16 U.S.C. 2113). They are chaired and administered by the State Foresters, or equivalent State officials, with membership composed of representatives from the following agencies, organizations, or individuals:

Forest Service; Natural Resources Conservation Service; Farm Services Agency; Cooperative State Research, Education, and Extension Service; local government; consulting foresters; environmental organizations; forest products industry; forest land owners; land trusts; conservation organizations; the State fish and wildlife agency; and others determined appropriate by the Secretary. The SFSCC makes recommendations to the State lead agency regarding the AON, AON amendments, and the determination of project priorities.

State Lead Agency is that unit of State government responsible for coordinating the establishment and implementation of the FLP in the State, as designated by the Governor or pursuant to State law. The State lead agency is usually a forestry agency, but may be another natural resource agency.

Tribal Assessments of Need- An AON is developed by a federally recognized Indian Tribe in cooperation with the State and the SFSCC. Only nontrust allotment lands are eligible for FLP. Lands or interests in lands purchased under a Tribal FLP can be through a grant to a cooperating State or through the Federal acquisition option.

Working Lands Conservation Committee is a committee of the NASF having coordination and consultation responsibilities within that organization regarding the FLP.

III. National Environmental Policy Act (NEPA)

NEPA applies to certain proposed actions of the Federal Government. NEPA does not apply to the independent actions of States or private property owners. It has no applicability to a private property owner's use or development of his/her property rights, nor the development of a State's FLP. It could apply to Federal agency actions undertaken on private property if the U.S. acquired a right to permit or deny certain land uses and then proposed to exercise that right, but in such an instance it would be the U.S. that would be required to satisfy NEPA requirements, not the private owner.

It should be known that:

1. 1. A Programmatic Environmental Assessment and a Finding of No Significant Impact was completed for the national FLP and signed by the Chief of the Forest Service.
2. 2. Under the Federal acquisition option, the FS NEPA regulations (Forest Service's Environmental Policy and Procedures Handbook 1909.15-92.1, effective 9/21/92), the acquisition of an individual Forest Legacy tract and/or easement may be categorically excluded from the preparation of an Environmental Impact Statement or an Environmental Assessment unless scoping indicates extraordinary circumstances exist.

IV. Coordination with State Forestry Agencies

Whereas most State lead agencies are State Forestry agencies, and the CFAA establishes

a broad cooperative relationship between the FS and State Foresters, the FS shall appoint a representative to coordinate with the Working Lands Conservation Committee of the NASF (or its successor) regarding the FLP. Periodically, the Director of Cooperative Forestry, and the appointed FS representative shall meet with the NASF Working Lands Conservation Committee to assess program operations, accomplishments, and policies. In States where the State Forestry agency is not the designated State lead agency for the FLP, a coordinating mechanism shall be instituted between the State lead agency, the State Forester, and the SFSCC.

V. Assessment of Need (AON) and Identification of Forest Legacy Areas (FLA)

A State or a federally recognized Indian tribe conducts an AON, in cooperation with the SFSCC, to document their need for inclusion in the FLP, through an evaluation of current forests, forest uses, and the trends and forces causing conversion to nonforest uses. Federally recognized Indian Tribes must cooperate with the SFSCC when conducting an AON for nontrust allotments lands. The AON is intended to define the Eligibility Criteria to be used in the identification of important forest areas to be proposed as an FLA; identify and delineate the boundaries of forest areas meeting the Eligibility Criteria for designation as an FLAs; determine through analysis what defines "threatened" and "environmentally important forests"; and outline the State's project evaluation and prioritization procedures. The AON must be developed in consultation with SFSCC and approved by the State lead agency.

State lead agencies may utilize the services of land trusts or other entities in preparing the assessment. Information from existing sources may be used to prepare the AON, instead of initiating new studies that would duplicate existing data. Examples of appropriate sources include State Forest Resources Plans, State Comprehensive Outdoor Recreation Plans, growth management studies, State cultural site inventories, inventories of threatened and endangered species, and other State, regional or local plans, studies or reports. The AON shall include relevant information about both public and private lands, address the issue of how best to maintain the integrity of forestlands for future generations, and address pertinent issues as identified by the State.

At a minimum, the AON must address the following as they relate to the purpose of the FLP:

□.1. Forest resources including:

- Aesthetic and scenic values;
- Fish and wildlife habitat;
- Minerals resource potential;
- Public recreation opportunities;
- Soil productivity;
- Forest products and timber management opportunities;
- Watershed values including water quality protection;

2. 2. The present and future threat of conversion of forest areas to nonforest uses. States are responsible for defining the conversion threat(s);

3. 3. Historic uses of forest areas, and trends and projected future uses of forest resources;
4. 4. Current ownership patterns and size of tracts, and trends and projected future ownership patterns;
5. 5. Cultural resources that can be effectively protected;
6. 6. Outstanding geological features;
7. 7. Threatened and endangered species;
8. 8. Other ecological values;
9. 9. Public recreational opportunities;
10. 10. Protected land in the State, to the extent practical, including Federal, State, and municipal lands and land trust organizations lands;
11. 11. Issues identified by the SFSCC and in the public involvement process.

Using the above information the AON shall include the following:
1. 1. Identification of applicable Eligibility Criteria;
2. 2. Identification of specific FLA(s) for designation;
3. 3. Specific goals and objectives to be accomplished by the FLP;
4. 4. Process to be used by the State lead agency to evaluate and prioritize projects to be considered for inclusion in the FLP.

The project evaluation and prioritization process outlined in the AON should reflect the direction set forth in the CFAA to give priority to lands which can be effectively protected and managed, and which have important scenic or recreational values, riparian areas, fish and wildlife values including threatened and endangered species, or other ecological values. Traditional forest uses such as forest management activities, including timber management, and outdoor recreation opportunities are considered consistent with purposes of the FLP and are encouraged on FLP tracts when consistent with the State's AON and the conservation purposes for FLP tract acquisition. The prioritization process should implement a strategy that enhances existing protected forestlands or local and State conservation strategies as outlined in the AON.

The composition of the SFSCC is defined in Section 19(b) of the CFAA (16 U.S.C. 2113). States are encouraged to broaden this composition to include interests appropriate to benefit the FLP. This committee cooperates with the State lead agency in the preparation of the AON, identification of FLA Eligibility Criteria, the identification of proposed FLAs from which lands may be entered into the FLP, and recommendation of priority lands to be considered for enrollment in the Program.

Public participation and involvement in the AON preparation is a State responsibility. In the absence of established State procedures, NEPA may serve as an appropriate model for public involvement. The State lead agency will solicit involvement and comments on the AON from the public including State and local governments. The goals of public involvement include hearing concerns and views from interested and affected individuals and organizations, receiving new information, identifying and clarifying issues.

Based on the State-wide AON, the State lead agency, in consultation with the SFSCC, identifies specific geographic FLAs that meet the Eligibility Criteria, and recommends them to the FS for designation as of a FLA.

States are encouraged to cooperate in the identification of FLAs that cross State boundaries and to work together to coordinate acquisitions of lands or interests in lands that have complementary purposes. However, program implementation is undertaken by the individual States (State Grant Option) or by the FS (Federal Option).

The identification of proposed FLAs must include:

1. 1. Location of each geographic area on a map and a written description of the proposed FLA boundary;
2. 2. Summary of the analysis used to identify the FLA and its consistency with the Eligibility Criteria;
3. 3. Identification of important environmental values, and how they will be protected and conserved;
4. 4. The conservation goals or objectives in each FLA
5. 5. List of public benefits that will be derived from establishing each FLA;
6. 6. Identification of the governmental entity or entities that may hold lands or interests in lands (State grant option) or may be assigned management responsibilities for the lands and interests in lands enrolled in the program (Federal option); and
7. 7. Documentation of the public involvement process and analysis of the issues raised.

VI. Eligibility Criteria for Establishing Forest Legacy Areas (FLAs)

The CFAA directs the Secretary to establish Eligibility Criteria for the designation of FLAs, in consultation with the SFSCC. These criteria should be based upon the FLP purpose to protect environmentally important forest areas that are threatened by conversion to nonforest and be further developed through the AON.

FLA boundaries must encompass forestlands with significant environmental and other resource-based values. Areas may also include nonforested areas such as farms and villages if they are an integral part of the landscape and are within logical boundaries. Since FLA boundaries may not correspond to property boundaries, tracts located partially within the geographically defined FLA are eligible for the FLP, upon approval of a boundary adjustment by the FS Region/Area/IITF.

Indian reservations and tribal lands may have important features on the forested landscape. Indian tribes and States are encouraged to collaborate and to consider only nontrust allotment lands for designation as, or inclusion within, a FLA. Other tribal lands are already protected through the trust relationship between the U.S. Department of the Interior and the tribe and are ineligible for the FLP.

States are responsible for determining what defines "threatened" and "environmentally important forest areas" in the State. However, environmentally

important forest areas shall contain one or more of the following important public values, as defined by the States:

1. 1. Timber and other forest commodities
2. 2. Scenic resources;
3. 3. Public recreation opportunities;
4. 4. Riparian areas;
5. 5. Fish and wildlife habitat;
6. 6. Known threatened and endangered species;
7. 7. Known cultural resources;
8. 8. Other ecological values.

The FS, State or unit of State or local government may only acquire lands and interests in lands identified within a FLA under FLP authority on a willing seller/willing buyer basis.

VII. AON and Amendment Approval

The State lead agency must submit the AON, including proposed FLAs and Eligibility Criteria, to the FS Region/Area/IITF. The FS Region/Area/IITF with input from the FS Washington Office reviews the AON and works with the State lead agency to complete the AON. Once finalized, the FS Washington Office forwards the AON to the Secretary for final approval. Final approval establishes the FLP for the State.

AONs shall be periodically reviewed (at least at 5-year intervals) by the State lead agency, the FS Region/Area/IITF, and the SFSCC to assess whether AON amendments or updates are necessary. The results of reviews will be documented by the State lead agency. AONs should be amended as needed.

The State lead agency may amend the AON to make significant changes or minor adjustments. Significant changes include modifications to their FLP, changes to the FLA Eligibility Criteria, or to add or delete a FLA. These changes need to be made in consultation with the SFSCC and with public involvement. FLAs and project evaluation criteria shall be of a scale and detail to effectively focus delivery of the FLP.

Significant Amendments to an AON may address the following:

1. 1. Issues associated with maintaining the integrity of forestland and the proposed FLA specifically.
2. 2. Revision, if any, of the FLA Eligibility Criteria.
3. 3. Changes in policies or conditions that have occurred since the previous AON;
4. 4. The identification of proposed FLA(s) and conservation goals or objectives associated with that FLA (see Section V for detail on FLA identification).

The Chief of the Forest Service, or designee, provides final approval of the Amendment of an AON authored by a State lead agency after consultation with SFSCC.

In addition, the State lead agency may complete minor AON amendments, such as FLA boundary adjustment or project prioritization process. These minor changes need to be coordinated with the SFSCC, and need review and approval by the appropriate FS Region/Area/IITF.

VIII. Multi-State Identification of Forest Legacy Areas

States are encouraged to cooperate in the identification of FLA that cross State or Tribal boundaries and to work together to coordinate acquisitions of lands or interests in lands that have complementary purposes.

States may elect to jointly use an existing or new multi-State or regional entity to identify FLAs or develop FLP projects that cross State boundaries. The entity must be a government-established organization, whose jurisdiction encompasses all or portions of the land area of the FLA States involved. However, program implementation is undertaken by the individual States (State Grant Option) or by the FS (Federal Option).

The entity conducting a multi-State identification of FLAs is responsible for:

- Obtaining approval from the appropriate States or Indian tribes for FLAs within their boundaries,
- Cooperating with appropriate SFSCCs,
- Obtaining public comments on the identification of FLAs, and
- Complying with all other requirements of these guidelines.

IX. Project Selection Process

The FS will conduct a project selection process to arrive at a prioritized national project list for consideration in the President's budget for the upcoming fiscal year. The project selection process and calendar of due date milestones are developed in consultation with the State lead agencies and FS Region/Area/IITF and communicated by the FS Washington Office. The FS will ensure that national evaluation and prioritization criteria are communicated to the States and in a timely manner so that submitted projects adhere to strategic goals and objectives of FLP. Project selection steps are:

Step 1: Release Project Selection Calendar with Due Dates (See Appendix A for example) The project selection process and calendar of due date milestones are developed in consultation with the States and FS Regions/Area/IITF and communicated by the FS Washington Office.

Step 2: State Project Prioritization and Submission FLP project applications are accepted

by the State lead agency as outlined in the State's AON. The SFSCC reviews and evaluates applications according to the criteria identified in the State's AON, authorizing statute, and other relevant direction and policy, and provides recommendations to the State lead agency. Projects approved and prioritized by the State lead agency are forwarded to the FS Region/Area/IITF for funding consideration. Only projects submitted through this process will be deemed eligible. Each State will prepare a list of projects and enter or update its list for submission to the FS via the Forest Legacy Information System or other means as requested.

Step 3: Forest Service Regional Review FS Regions/Area/IITF will review submitted projects considering State priorities and national criteria. The purpose of this review is to improve project viability, facilitate the national project selection process and advance the strategic outcomes of the FLP. FS Regions/Area/IITF will submit projects to the FS Washington Office for funding consideration.

Step 4: National Review; Develop National Project List The FS Washington Office will develop a prioritized national project list by convening a panel. There are 3 purposes of the panel; 1) assure that all projects meet Congressional and Administration direction; 2) assure that projects meet national program goals; and 3) develop a National List of ranked projects. The composition of the panel shall be developed annually in consultation between the State lead agencies and the FS, and will be representative of geographic regions. Project evaluation and ranking is based on the following national core criteria; project readiness will be considered as well as other evaluation considerations developed in consultation with State lead agencies and FS Regions/Area/IITF. The national core criteria are:

- Important – The public benefits gained from the protection and management of the property including environmental values, and the economic and social aspects;
- Threatened – Conversion to nonforest uses is likely or imminent and will result in a loss of forest values and public benefits; and
- Strategic – Fits with a larger conservation plan, strategy, and initiative and enhances previous conservation investments.

States newly entering FLP will be given a "New-State start-up" preference for an initial FLP project. This is a placeholder for planning purposes and does not guarantee project funding. In order to receive the New State start-up project funds the State must have an approved AON and the project must meet national core criteria and the State's evaluation criteria and be submitted within the fiscal year that the placeholder is approved by Congress.

Step 5: Submit National FLP Project List to the Office of Management and Budget and to Congress

Each fiscal year, the FS Washington Office will submit a project list to the

Office of Management and Budget for funding consideration in the President's budget. Once the President's budget has been completed, the FS Washington Office will notify the appropriate House and Senate Committees and Subcommittees of the recommended projects for the upcoming Fiscal Year.

X. Program Fund Categories

Forest Legacy funds are allocated to one of three categories: Project Funds, Administration Funds, and AON Preparation Funds. FLP funds may not be used for monitoring and enforcement.

A. Project Funds Project funds are those used to directly purchase lands or interests in land joining the FLP. Project funds may be expended by the State lead agency or the FS, as applicable, to cover transaction costs, including but not limited to: appraisals and appraisal review, land surveys, closing costs, establishing baseline information, title work, purchase of title insurance, conservation easement drafting, and other real estate transaction expenses for those tracts. Project funds may also be expended to facilitate donations of land or interests in lands to a qualified and willing donee for FLP purposes, by paying for expenses directly related to the donation, including but not limited to, land surveys, conservation easement drafting, title work, and establishing baseline information. For an outright donation of a conservation easement or land, FLP program funds may not be used to pay for an appraisal. In the case of a partial donation of a conservation easement or land, an appraisal meeting Federal standards is required to determine the value of property. FLP funds may be used for appraisals on these partial donations. When Federal funds are used to purchase real property, including conservation easements, appraisal and acquisition work procedures must meet Federal standards.

B. Administration Funds Administrative funds are the portion of funds used for day-to-day program management at all levels. Administration funds may be used for a variety of activities, including FLP program administration, personnel and overhead, and all activities identified as eligible uses of project funds to prepare projects and potential projects. Forest Legacy funds for administration shall be kept to a minimum. As a goal, all attempts should be made to keep administration funds under 15 percent of the total funds appropriated.

C. AON Preparation Funds AON preparation funds may be made available to States to help defray the cost of preparing, or amending an AON.

XI. Process for Allocating Funds to Forest Service Regions/Area/IITF

Following passage of the annual appropriations bill, the FS Washington Office develops the Forest Legacy Program Direction and allocates funds to the FS Regions/Area/IITF for distribution. The allocation process differs for each fund category described below.

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A. Allocation of Project Funds Allocations to FS Regions/Area/IITF are based on the results of the national project selection process and the appropriations bill. Under the State grant option, FS Regions/Area/IITF will award grants to States for specific, identified projects.

B. Allocation of Administration Funds The FS Washington Office distributes administration funds to FS Regions/Area/IITF. Each FS Region/Area/IITF in consultation with the States requests these funds to meet their needs and the needs of the participating states in their Region/Area/IITF. Administration funds are also used by the FS Washington Office to fund program management functions. Administration funds will be granted to States under the State grant option separately from project funds.

C. Allocation of AON Preparation Funds The FS Washington Office distributes AON preparation funds to the States by way of FS Regions/Area/IITF. These funds are requested by FS Regions/Area/IITF to meet the needs of their States to develop new AONs or amendments.

XII. Redirection and Reprogramming of Funds

Due to the nature of real estate transactions, FLP projects may change in scope, cost or fail completely. These changes can result in unspent or excess funds for some projects while others may need additional funding to bring them to completion. In order to maximize the efficient and effective use of FLP project funding, the FS will either redirect or request reprogramming of funds. Redirection is a shift of funds from one congressionally approved project to one or more other congressionally approved project(s). Reprogramming is a shift of funds that exceeds an increase or decrease of 10% per project not to exceed $500,000 to an existing project, or shifting of any amount of funds to a project not previously approved by Congress.

Regional Redirection Process FS Regions/Area/IITF may redirect up to an increase or decrease of 10% per project not to exceed $200,000 of project funds that are excess or unspent from one project to one or more other Congressionally approved project(s) within the FS Region/Area/IITF which is underfunded and where there is a substantiated need (e.g. loss of other funding sources, appraisal documenting increased cost, etc.) to bring the project to completion. Project funds over $200,000, or those that cannot be redirected by the FS Region/Area/IITF, will be released for the national process. FS Regions/Area/IITF will notify the FS Washington Office before a redirection takes place and report these actions periodically. All funds from failed projects will be released for the national process.

National Redirection Process The FS Washington Office, through consultation with FS Regions/Area/IITF, may redirect up to an increase or decrease of 10% per project not to exceed $500,000 of project funds that are excess or unspent from one project to one or more congressionally approved project(s) which is underfunded and where there is a substantiated need (e.g. loss of other funding sources, appraisal documenting increased

cost, etc.) to bring the project to completion. In addition, when funds have not been spent or contractually obligated within two years of receipt of funds, they revert to the FS Washington Office via the appropriate FS Region/Area/IITF. The FS Washington Office will:

1. 1. Assess the extent of unspent or returned funds on a periodic basis;
2. 2. Facilitate selection and funding of underfunded projects not addressed by the regional process or between FS Regions/Area/IITF; and
3. 3. Notify Appropriations Subcommittees of any redirection action taken by the FS FS Regions/Area/IITF or FS Washington Office.

National Reprogramming Process The FS Washington Office, through consultation with FS Regions/Area/IITF, may request reprogramming by the Appropriations Subcommittees of unspent or returned funds to a project that requires more than an increase or decrease of 10% per project not to exceed $500,000 to complete. In addition, the FS Washington Office may request reprogramming by the Appropriations Subcommittees of unspent or returned funds to a project not previously approved by Congress. The FS Washington Office will:

1. 1. Determine the funds available for reprogramming on a periodic basis.
2. 2. Identify underfunded projects that cannot be addressed through the Regional Redirection Process and determine the priority for reprogramming.
3. 3. Recommend reprogramming to fund projects from the National Project List next in sequence in priority ranking to the extent practicable.
4. 4. Submit reprogramming requests to the Appropriations Subcommittees for approval.
5. 5. Allocate funds to projects approved for reprogramming.

XIII. FLP Cost Share Requirements

The CFAA directs that, to the extent practicable, the maximum Federal contribution for total program costs may not exceed 75 percent. To assure program-wide cost share goals are met, each project budget must include a minimum nonfederal contribution of 25 percent (See Appendix D for examples of cost share calculations). This nonfederal cost-share must meet Forest Legacy purposes. It may consist of: (1) the value of land, or interest in land, dedicated to the FLP that is not paid for by the Federal government; (2) nonfederal costs associated with program implementation; and (3) other nonfederal costs associated with a grant or other agreement that meets FLP purpose. The nonfederal cost-share must be documented, and in the case of a grant, must meet the timing, terms, and conditions of the grant. The cost-share can occur at any phase of the FLP including planning, developing future projects, acquisition, capital improvement, management, or administrative activities. When a grant is involved, the cost-share must occur within the life of a grant and meet all grant requirements. Federal requirements identify the grant period as beginning when the grant is formally awarded and ends after two years to ensure that the federal funds are spent promptly. However, a grant may receive a maximum extension to five years. Allowable costs shall be determined in accordance with the 7 CFR 3016, "Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments," and any amendments to this regulation

(See Appendix C for list of applicable Office of Management and Budget (OMB) Circulars and other regulations).

Donations of land or interests in land must be documented to count as part of the nonfederal cost-share. The title does not need to be transferred to the State or federal government in order for the donation to qualify as cost share. However, if in the future, the donated lands are conveyed or the rights or title are modified in a way that is inconsistent with the purposes of the FLP then the State must restore the cost share value dedicated in the grant agreement. The value of donations may be included as part of the nonfederal cost-share if all of the following are met:

1. 1. The donation contributes to the objectives and priorities of the State FLP as set forth in the AON;
2. All or part of the tract being donated must be within the boundaries of an FLA, and may include National Park, National Forest, National Wildlife Refuge, or other Federal land boundary, or within the boundaries of an area designated through an analogous State program with goals compatible with the FLP and be within an FLA;
3. The donor documents their desire that value of the interests may be used as cost share for the FLP project;
4. The donation of land or an interest in land must contain perpetual covenants to assure that the tract will be managed in a manner compatible with the goals for which the FLA was established;
5. The donee (holder of donated rights) is a unit of government or a non-profit conservation organization (land trust) that meets the eligibility requirements for holding a conservation easement established by the Internal Revenue Service and has as its purpose the management of lands or interests in land consistent with FLP purposes;
6. If the donation is in the form of a conservation easement then the deed needs to contain a provision that directs all of the easement holder's proceeds from a subsequent sale or exchange of interests in land be used in a manner consistent with the conservation purposes identified for the subject interests in lands;
7. The respective portion of the donation must not have been previously credited towards any Federal program's nonfederal cost share; and
8. The State lead agency approves the donation as contributing to the cost-share.

XIV. Acquisition of Lands or Interests in Lands

FLP acquisitions may be outright full fee purchases, or acquisition of development rights or other rights conveyed through a conservation easement. Except in the case of a full and complete donation of land or an interest in land, if any Federal funds are used in the acquisition of Forest Legacy tract the following shall apply:

1. Federal appraisal standards must be met, including appraisal review by a qualified Review Appraiser;
2. The landowner must be informed in writing of the market value and that sale of the property is strictly voluntary;
3. The landowner must be notified in writing that the property will NOT be purchased if negotiations do not result in amicable agreement;
4. Federal payment to the landowner for lands or interests in lands is not more than

the market value as determined by an appraisal meeting Federal appraisal standards;

5. The title acquired must be free of encumbrances inconsistent with the purposes of the FLP. Title insurance may be secured for the full value of the encumbered property, but is not an alternative to an acceptable title; and

6. If relocation is involved the requirements in the Uniform Relocation Assistance and Real Estate Property Acquisition Policies Act of 1970 (PL 91-646 or 42 U.S.C. 4601) must be followed. The FS will be advised in advance of any acquisition involving relocation.

7. In the case of acquisition of interested in lands, the development of a Forest Stewardship Plan or multi-resource management plan that has been approved by the landowner and the State Forester or designee and Baseline Documentation Report shall be prepared prior to project closing (See Appendix J for sample content and references).

All FLP acquisitions of lands or interest in lands are perpetual and therefore run with the land. Although any remaining interests held by the landowner may be subsequently conveyed, future owners are still bound by the terms and conditions of the conservation easement. At the same time, future owners shall retain full control of the rights that are not acquired by the FLP, and shall be subject only to those restrictions that the present landowner has conveyed to the Federal, State, or local government.

Compatible nonforest land uses (cultivated farmland, pasture, grassland, shrubland, open water, and wetlands) are desirable land uses in many FLAs. FLP funds should not be used for any property not meeting the State's definition of forested land in the AON, unless there is a written plan scheduling reforestation or afforestation. Programs to conserve farms, ranches and similar land uses may be used in conjunction with the FLP to protect properties where there are mixed forest and compatible nonforest uses.

Conservation easements are required to contain language pertinent to the purpose of the FLP and a reversionary provision to ensure the conservation investment of FLP into the future (Example clause language are found in Appendix I). During the development of tract specific conservation easements, a determination will be made as to whether the acquisition of mineral rights, prohibition on reserved areas, or an exclusion of the area that does not comply with FLP, would be necessary in order to protect the other rights that are being considered for acquisition. In some situations, it may be impossible to protect environmentally important forest areas pursuant to the purpose of the FLP without acquiring the mineral rights.

The FLP conservation easement holder (Federal, State or local government) is responsible to assure that baseline documentation contains all the information necessary to monitor, manage and enforce the easement. Where the conservation easement is a tax-deductible gift, and the owner retains rights to the property, the Internal Revenue Service (IRS) holds the donor responsible for providing sufficient baseline data "to establish the condition of the property at the time of the gift." (See Treas. Reg.§1.170A-14(g)(5)(i)). However, this does not eliminate the FLP need for baseline documentation.

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Baseline documentation describes or depicts a tract of land and its attributes on the day it becomes restricted by an easement. This documentation is required on all FLP tracts and is completed prior to project closing. Documentation of the property should include a map of the area drawn to scale showing all existing man-made improvements or incursions such as roads, buildings, fences or gravel pits; an aerial photograph of the property taken as close to the date the property is restricted as possible; and on-site photographs, especially of significant features. The above should be accompanied by narrative descriptions of tract attributes and other pertinent information.

States and landowners are encouraged to display the official FLP signs on the FLP property using the signs in accordance with Appendix K. The posting of FLP tracts helps promote public awareness, recognition and support for the program. Landowner permission should be secured before posting any signs. Costs associated with sign posting can be covered by FLP project or administration grants or States may use such expenses as FLP cost share. Signs should be inspected during the annual monitoring of the FLP tract and repaired when in poor condition.

FLP sign art and program logos may be used by FLP partners for items that contribute to the purpose of awareness (e.g. brochures, workshops, outreach efforts, posters, FLP information packets, web sites etc.)

XV. Appraisal and Appraisal Review

The FLP policy on appraisal is that all FLP acquisition of land or interests in land using Federal funds must comply with Federal appraisal standards contained in the publication entitled "Uniform Appraisal Standards for Federal Land Acquisitions: Interagency Land Acquisition Conference, 2000," as amended or updated. Appraisals and appraisal reviews may be conducted by any qualified appraiser meeting the minimum standards outlined in Appendix H.

The FLP will ensure high quality appraisal service and accountability to the program by:

- Annual planning and coordination of appraisal work to allow for efficient allocation of resources.
- Requiring checks and balances:

a. States will ensure that qualified appraisers trained and competent in appraisal, appraisal review and knowledgeable of Federal standards will be used. The State may use State, contract or Federal appraisal or review services to meet this requirement.

b. States or the FS will review contract appraiser qualifications as stated in Appendix H before they are employed to conduct a FLP project appraisal or review.

c. The appraiser and identified review appraiser will engage in an initial consultation before the project appraisal takes place. The review appraiser will develop project specific appraisal instructions for the appraiser as a result of this consultation.

d. The FS will conduct spot checks of appraisal reviews to ensure quality and accuracy.

e. Forest Legacy funds can only be used to purchase lands and interests in land after the appraisal review confirms that the appraisal meets the *Uniform Appraisal Standards for Federal Land Acquisitions.* It is recommended that an offer not be made until the appraisal review is approved.

XVI. Conservation Easement Monitoring, Management, Record-Keeping & Enforcement

The governmental entity holding title to interests in land acquired under the FLP shall monitor and manage those interests in perpetuity. The holder may delegate or assign monitoring, management, and enforcement responsibilities over lands and interests in lands acquired under the FLP only to other Federal agencies or State or local government entities. Such delegation or assignment of responsibility shall be documented by a written agreement. The governmental entity responsible for monitoring, management and enforcement of the conservation easement may in turn delegate or assign management and monitoring authority to other parties, to include land trusts, conservation groups, and other governmental entities. Such delegation or assignment of authority shall be adequately documented and the FS shall be notified. The FS shall approve agreements involving any interests in lands held by the Federal Government prior to such delegation or assignment. Once interests in lands are acquired, the State lead agency, FS, and others as appropriate, may negotiate tract-specific Memorandums of Understanding (MOU) as necessary to specify management and monitoring responsibilities for the interests in lands.

Optimal management and monitoring of tracts in FLAs is based upon partnerships between landowners, private non-profit organizations owning or managing lands, and State and Federal officials. Land trusts and other private organizations will continue to manage and monitor their own easements and lands within designated FLAs, and while they may not manage government-owned interests in lands under the FLP, they may cooperate with or contract for monitoring and implement specific management activities. Management of federally owned interests in lands is reserved to the FS, but may be assigned to State or local governments, or another Federal agency through mutual agreement. Although delegable, enforcement actions for easements will generally be conducted by the easement holder, i.e., the State or the Federal Government.

Monitoring FLP conservation easements shall occur periodically, but not less than annually. Monitoring consists of visual inspection of the property, documented by a written report to explain the condition of the property at time of inspection. Any material departure from the baseline documentation report or Forest Stewardship Plan should be noted. The easement holder should immediately address any violation of the conservation easement with the landowner. The landowner should have the opportunity to correct the breach. After a reasonable time period (e.g. 30 days), if the breach is not corrected, enforcement action may be taken, including but not limited to, legal means. The unit of government holding the conservation easement has the initial responsibility to enforce the conservation easement. See Appendix G, Real Estate Record Keeping for suggestions on what information should be kept.

The State or easement holder shall promptly notify any future FLP tract owner of the FLP and the origin and requirements of the conservation easement.

The Forest Stewardship Plans covering the tract shall be reviewed periodically and updated as needed. If there is a change in land ownership, then the Forest Stewardship Plan needs to be reviewed, and updated as needed.

XVII. Landowner Participation

Landowner participation in the program is voluntary and consists of two elements:

1. Conveyance of lands and interests in lands to achieve the purpose of the FLP;
2. Preparation and periodic updates of a Forest Stewardship Plan or a multi-resource management plan. The landowner and the State Forester or designee must approve the plan prior to signing the acquisition of the easement. The plan shall include provisions to meet land conservation objectives of the FLP. The plan shall be kept current and updated as needed. Modifications of the plan must be agreed to by the State lead agency. A plan is not needed if the lands are purchased in fee. (See Appendix F for sample content of a Forest Stewardship Plan)

Landowners may submit an application and property information (See Appendix E) to the State lead agency to enroll their land or interests in lands in the FLP according to the process described in the AON. All owners of eligible forestlands within the designated FLA, and meeting the minimum Eligibility Criteria or other application requirements described in the AON, are eligible to submit an application.

For a landowner to participate in the program, it is not required that their tracts be completely forested. (see definition of "Nonforest Uses" and "Reserved Areas") However, priority will generally be given to tracts that are currently forested or are identified to be forested in the landowner Forest Stewardship Plan or multi-resource management plan.

The FLP respects the rights of private property holders. Under no circumstances shall the right of eminent domain be used for the unwilling "taking" of any private property rights. Traditional forest uses such as forest management activities, including timber management, and outdoor recreation opportunities are deemed consistent with purposes of the FLP and are encouraged on FLP tracts when consistent with the State's AON and the conservation purposes for FLP tract acquisition.

The FLP adheres to language contained in Section 14 of the CFAA, Statement of Limitation: "This Act shall not authorize the Federal Government to regulate the use of private land or to deprive owners of land of their rights to property or to income from the sale of property, unless such property rights are voluntarily conveyed or limited by contract or other agreement. This Act does not diminish in any way the rights and responsibilities of the States and political subdivisions of States." Purchase or donation

of rights does not relieve landowners of regulations that would otherwise apply. The FS has no jurisdiction to make tax determinations or render advice as to the tax implications of transactions. Since tax implications differ from person to person, landowners should be encouraged to seek independent counsel from local assessors, tax lawyers, or accountants.

XVIII. Land Trust Participation

Land trusts are nonprofit organizations that protect land by working with landowners wishing to donate or sell fee title or conservation easements to maintain conservation values associated with the land. Land trusts can have an important role to play in the FLP. The following considerations apply to land transactions between the Federal Government/States and land trusts:

1. Land trusts cannot execute contracts for acquisition of interests in lands on behalf of the Federal /State Government. Land trusts may work as intermediaries for eventual Federal/State acquisition, but without an accepted land purchase option and contract with the FS there is no guarantee of Federal acquisition. No pass-through transactions shall be done without prior consultation with the FS/State.
2. With approval of the State lead agency, the FS, the land trust or the donating landowner, lands and interests in lands acquired by land trusts (pursuant to Final Guidelines Part 1, Section XIII) may be counted toward the nonfederal cost-share contribution, provided that the interests in lands permanently contribute to the FLP.
3. If a land trust proposes a pass-through transaction to the FLP it must assure that terms and conditions in the deed or conservation easement are reviewed and approved in advance by the State lead agency and/or the FS.
4. The monitoring of easements within FLAs may be performed by land trusts in accordance with the umbrella MOU for the FLP in that State and individual MOUs for specific tracts established between the State and the land trust organization.
5. Other appropriate and beneficial roles of land trusts in relation to the FLP may include: participation on the SFSCC; recruitment and facilitation of FLP projects; buyer of tracts or easements of proposed, but unfunded FLP projects; facilitators of local FLP efforts; and performing tract monitoring and management activities.

PART 2 - STATE GRANT PROGRAM

The State lead agency elects the State grant option of the FLP, in writing, to the appropriate FS Region/Area/IITF.

When a State elects the State grant option, all FLP acquisitions shall be transacted by the State with title vested in the State or a unit of State or local government. There are two exceptions:

1. Donations where the donor may wish to make a donation to a land trust, local, or Federal Government and the donee agrees to accept the donation, and to manage the

lands or interests in lands in perpetuity for FLP purposes; and
2. At the request of the State and at the discretion of the FS, the FS may acquire individual tracts or multiple tracts within a specified FLA, with title vested in the

U.S. in accordance with Part 3 of these guidelines.

I. Grants

If a State elects the optional State grant option, the FS will provide a Federal grant to the State to carry out the FLP, including the acquisition by the State of lands and interests in lands. Grants must be consistent with the uniform administrative requirements established in 7 CFR 3016. States will generally be reimbursed for costs incurred with cash advances limited to the minimum amounts needed and timed to be in accord only with the actual, immediate cash requirements of the State in carrying out the FLP. The timing and amount of cash advances shall be as close as is administratively feasible to the actual cash outlay by the State for direct program costs and the proportionate share of any allowable indirect costs.

A. Conditions of the Grant
1. States must submit annual performance and financial status reports. A final performance report and financial status report are required prior to close out of the grant.
2. Funds appropriated for the FLP shall not be included in consolidated-payment grants made under authority of Section 12 of the CFAA.
3. The State shall maintain current and complete financial records in accordance with requirements contained in the latest Federal Aid Manual and OMB Circular (See Appendix C).

B. Eligible Activities The following activities are eligible uses of funds granted to States for the FLP; however, in most cases costs incurred prior to issuance of the grant cannot be reimbursed:
1. Purchase of lands or interests in lands from willing sellers for inclusion in the FLP;
2. Facilitation of donations of lands or interests in lands to a qualified and willing donee for FLP purposes;
3. Program administration expenses limited to indirect costs and direct acquisition related expenses for lands and interests in lands acquired under Forest Legacy authority;
4. Establishment and documentation of baseline conditions and development of a Forest Stewardship Plan for a conservation easement; and
5. AON Planning and amendment.

The following uses of Forest Legacy funds are not allowed as part of a State grant:
1. Management of acquired lands or interests in lands including, monitoring of conservation easements,
2. Enforcement actions, and

3. Payment for appraisals of donated property when the donation represents the full and total value.

C. Availability of Funds Project funds for any fiscal year shall be available to the State for two years from the time they are obligated in a FS grant to the State in order to insure that Federal funds are spent promptly to acquire FLP projects. However, a grant may have a maximum duration of five (5) years to allow for nonfederal cost sharing to occur. During the 5-year life of the grant, it can be amended annually, as needed, and funds from a new fiscal year added to the grant, consistent with the requirement that the funds be expended within two years of the time of obligation. In no case can funds be obligated or expended beyond the 5-year life of the grant.

II. Acquisition of Lands and Interests in Lands by States

All Forest Legacy acquisitions including the acquisition of lands or interests in land shall be made in accordance with Federal appraisal and acquisition standards and procedures. The interests in land acquired for Forest Legacy shall be adequate for Forest Legacy purposes and be perpetual. Title to such lands or interests in lands will be vested in the State or unit of State government. These lands or interests in lands will be managed and administered for goals consistent with Forest Legacy conservation purposes by State agencies or their assigns. The State agencies are responsible for all monitoring and management of conservation easements and management of fee simple properties.

Lands and interests in land located within a FLA and simultaneously within other Federal boundaries (e.g. national forest, national park, or national wildlife refuge) are eligible for the FLP provided that the responsible Federal agency concurs with the FLP State acquisition. If a State has passed legislation that extinguishes claims to or restrictions on real property, the State shall use all available authorities, including that of acting as an agent of the U.S., to achieve the purposes of section 7(K)(2) of the CFAA.

III. Reversion of Funds for Forest Legacy Inconsistency

In the event it is determined, by the State lead agency, that it is no longer desirable to hold lands or interests in lands acquired with Federal funding and those lands are conveyed, exchanged, or otherwise disposed of, after providing notice to the FS, the State shall:

1. Reimburse the FS for the current market value in proportion to the original Federal investment; (said reimbursements to be used to further the purposes of the FLP); or

2. Exchange for other FLP eligible lands or interests in lands of at least equal market value and of reasonably equivalent location, with public purposes that equal or exceed those of the disposed tract, with FS approval.

Items 1 and 2 identified above must be included in deeds or conservation easements of all FLP tracts as well as in the FS grant to the State. Appendix I includes suggested language for conservation easements and deeds.

PART 3 - FEDERAL ACQUISITION PROGRAM GUIDELINES

I. Federal Acquisition Process

In the furtherance of the purposes of the FLP, the State lead agency with involvement of the SFSCC and the FS will review property owner applications, prioritize tracts, obtain State approval, and submit properties to the appropriate FS Region/Area/IITF for funding. Upon approval for funding, the FS will proceed to acquire from willing sellers conservation easements and/or other interests in land including fee acquisition.

Federal Acquisition Procedures must be followed when Federal funds are used to complete an acquisition of land or interests in land using FLP authority. They are:

1. Federal appraisal standards must be met;
2. The landowner must be informed of the market value and that sale of the property is strictly voluntary;
3. The landowner must be notified in writing that the property will NOT be purchased if negotiations do not result in an amicable agreement;
4. Federal payment to the landowner for lands or interests in lands is not more than the market value determined under #1;
5. Assure title is free and unencumbered relative to the purposes of the FLP; and
6. If relocation is involved the requirements in PL 91-646 (42 U.S.C. 4601) must be followed and the FS must advise the landowner prior to the acquisition.

Certain lands are not eligible for the Federal ownership option under FLP authority because other authorities and funding sources are available for acquisition of lands or interests in lands within these federally established areas. These include lands or interests in lands located within National Forests, National Parks, National Wildlife Refuges, or other Federal Government boundaries. Proximity to Federal lands or the inclusion of Federal lands within a proposed FLA does not disqualify an area for program eligibility.

Federal laws governing public lands do not apply to private property rights not acquired by the Federal Government from willing private landowners. Interests in lands retained by private landowners, not conveyed to the Federal Government under the FLP, are subject to the same requirements of the Endangered Species Act (ESA) that existed prior to their participation in the FLP. Conveyance of interests in lands to the Federal Government neither enhances nor diminishes the landowner's responsibility under the ESA. Any interests in lands acquired by the Federal Government under the FLP shall be subject to the same requirements of the ESA as are other Federal lands.

EXHIBIT "B"

II. Memorandum of Understanding (MOU) for Coordination of the FLP

An MOU will be used to coordinate the FLP where Federal acquisition option resulting in Federal ownership of FLP acquisitions occurs. The MOU will define and facilitate partnerships between the State lead agency, FS, and other participating entities in implementing the program, acquiring interests in lands, and sharing the costs of the program. The MOU shall determine how costs are shared between parties, including administrative, management, monitoring, and capital improvement expenses. The terms of a MOU will determine which party is responsible for costs incurred following the project's five-year cost-share write off period.

If individual Forest Legacy tract-MOUs are needed, they become an addendum to the State level "umbrella" MOU. The umbrella MOU between the State lead agency and the FS shall be developed following the Secretary's approval of the State's AON and the establishment of the State's FLP.

The FS/State MOU is for the purpose of specifying roles and responsibilities for implementing the program, and may address the following items:

1. Costs and Funding:

□.a. Identify direct and indirect costs expected to be incurred in establishing the FLP, and acquiring and administering interests in lands during the first five years of the program. Revise or renew these cost estimates as appropriate.

□.b. Identify and propose sources of cost-share matches.

2. Planning:

□.a. Document the amount of work required to complete the AON and identification of FLAs.

□.b. Define a process for revising existing landowner Forest Stewardship Plans, or multi-resource forest management plans.

□.c. Identify how specific tract acquisition needs and priorities shall be established by the State.

3. Acquisition:

□.a. Identify who is responsible for title work, appraisals, surveys, and similar pre-acquisition work.

□.b. Define a process for determining the value of donated interests in lands.

4. Management:

□.a. Define responsibilities for management of interests in lands acquired or dedicated to the program.

□.b. Identify possible activities needed to enhance, restore, or maintain resources to meet the intent of the program and general responsibilities in carrying out such activities.

5. Administration:

□.a. Estimate the staff-work required to implement the Program.

□.b. Define responsibilities for processing applications to the FLP.
□.c. Establish procedures for monitoring and enforcement the terms of reserved interest deeds and easements and identify who will be responsible.
□.d. Identify responsibilities for periodic reports summarizing the achievement of FLP goals in the State.

III. Payment in Lieu of Taxes (PILT)

Where the Federal Government under the FLP acquires lands in fee, the Federal Government will pay PILT to the local taxing authority. No PILT will be paid on conservation easements.

IV. Transition to State Grant Option Program

If a State elects the State Grant Option, and there are active cases being pursued by the FS, all parties (FS, State, and landowner) may agree to transfer the case to the State. If agreement to transfer is reached, then the value of the lands or interests in lands comprising the project may be transferred to the State by a FS grant. To facilitate projects transferred to the State, the FS may provide the State with copies of any appraisals, appraisal reviews, title reports, option contracts and other pre-acquisition materials for lands that have been under negotiation by the FS.

APPENDIX A- Example of a Project Selection Calendar

This flowchart outlines the basic FLP project selection process.

EXHIBIT "B"

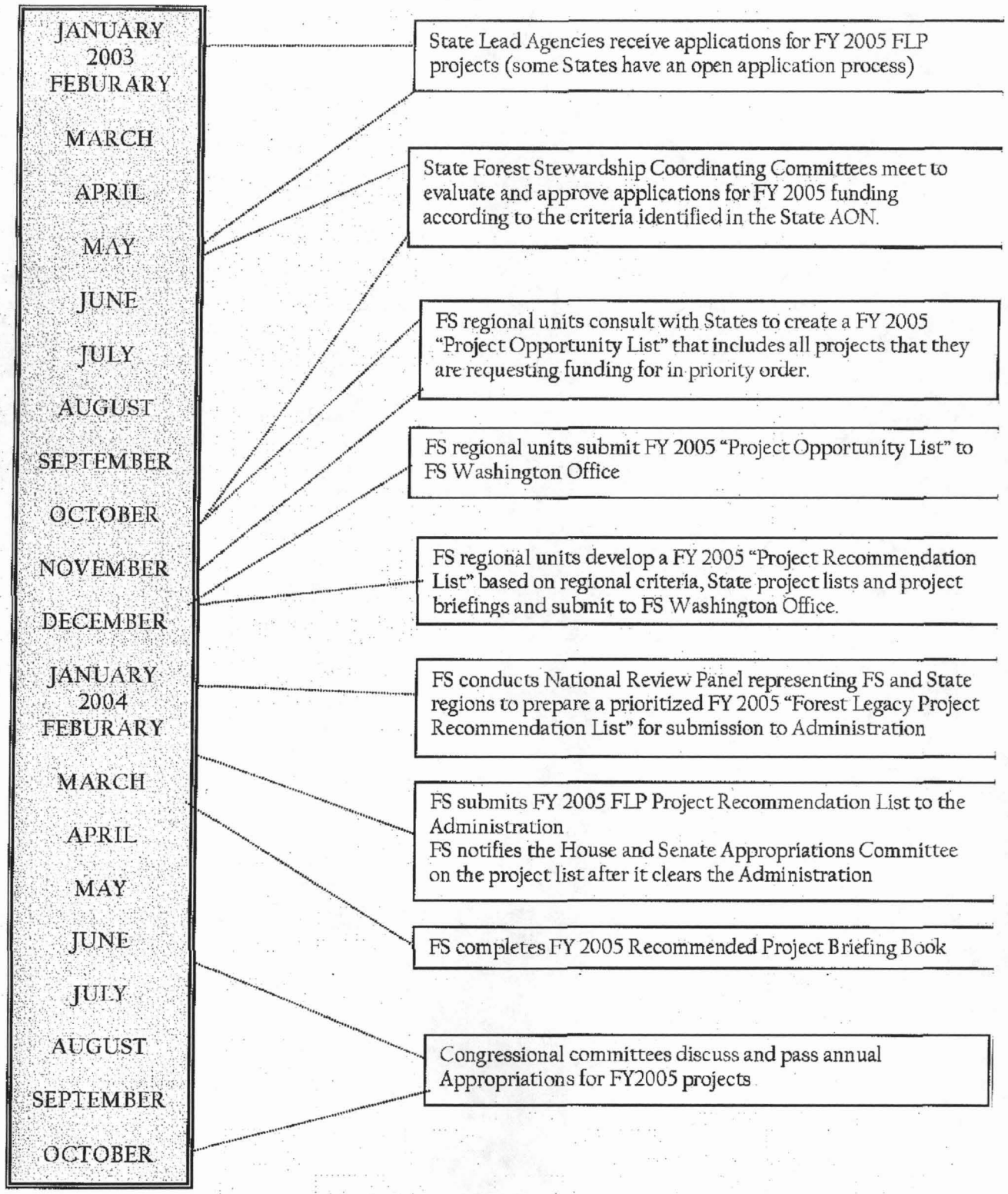
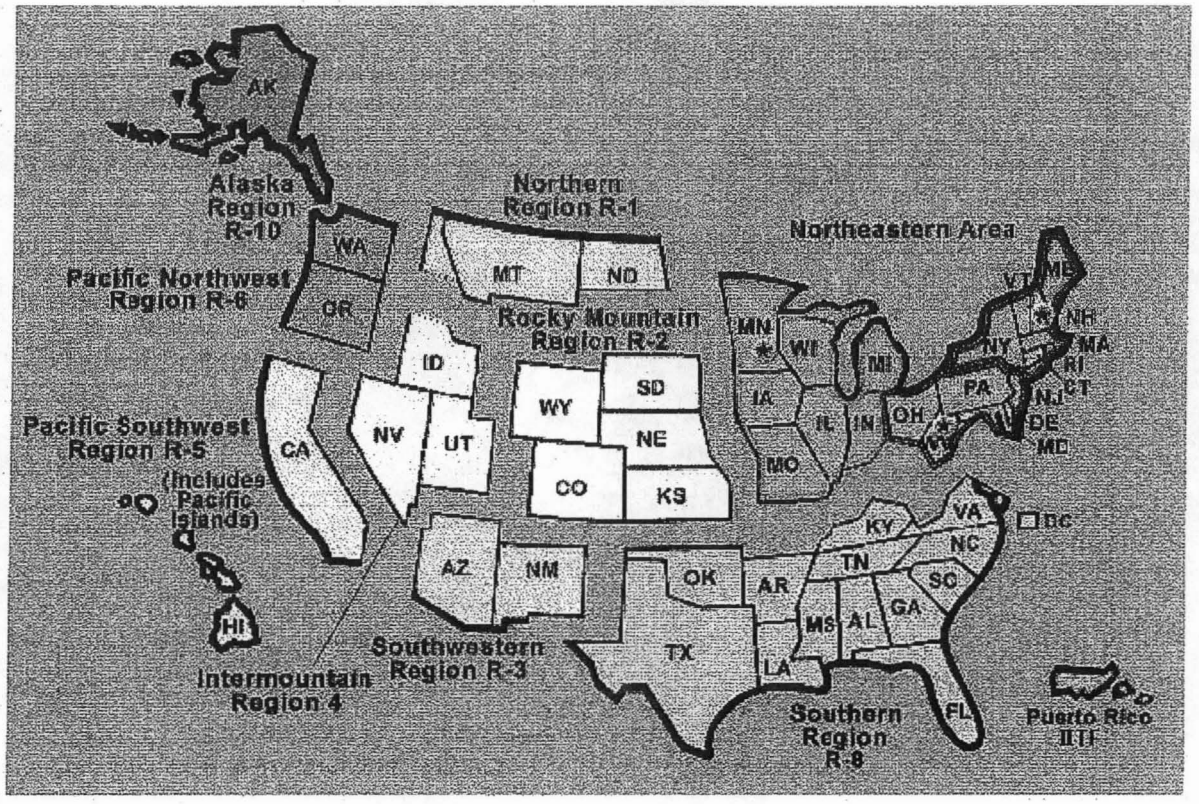

JANUARY
2003
FEBURARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
2004
FEBURARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
State Lead Agencies receive applications for FY 2005 FLP projects (some States have an open application process)
State Forest Stewardship Coordinating Committees meet to evaluate and approve applications for FY 2005 funding according to the criteria identified in the State AON.
FS regional units consult with States to create a FY 2005 "Project Opportunity List" that includes all projects that they are requesting funding for in priority order.
FS regional units submit FY 2005 "Project Opportunity List" to FS Washington Office
FS regional units develop a FY 2005 "Project Recommendation List" based on regional criteria, State project lists and project briefings and submit to FS Washington Office.
FS conducts National Review Panel representing FS and State regions to prepare a prioritized FY 2005 "Forest Legacy Project Recommendation List" for submission to Administration
FS submits FY 2005 FLP Project Recommendation List to the Administration
FS notifies the House and Senate Appropriations Committee on the project list after it clears the Administration
FS completes FY 2005 Recommended Project Briefing Book
Congressional committees discuss and pass annual Appropriations for FY2005 projects

EXHIBIT "B"

APPENDIX B- Map of the Forest Service Regions/Area/IITF



National Association of State Foresters' (NASF) Geographic Regions:

North: All States within the Forest Service's Northeastern Area.

South: All States within the Forest Service's Southern Region (R-8) and International Institute of Tropical Forestry (IITF).

West: All States within the Forest Service's Northern (R-1); Rocky Mountain (R-2); Southwestern (R-3); Intermountain (R-4); Pacific Southwest (R-5); Pacific Northwest (R-6); and Alaska (R-10) Regions.

APPENDIX C- Office of Management and Budget (OMB) Circulars and Other Regulations

Any award of Federal financial assistance under these guidelines will be subject to the following or its most recent update:

1. OMB Circular A-102 (10/7/1994, amended 8/29/1997), "Grants and Cooperative Agreements with State and Local Governments"

2. OMB Circular A-87 (5/4/1995, amended 8/29/1997), "Cost Principles for State, Local, and Tribal Governments" as implemented by Departmental Regulation 7 CFR 3016, "Uniform Administrative Requirements for Grants and Cooperative Agreements to

State and Local Governments"
3. OMB Circular A-110 (11/19/1993, amended 09/30/1999), "Uniform Administrative Requirements for Grants and Other Agreements with Institutions of Higher Education, Hospitals and Other Non-Profit Organizations"
4. OMB Circular A-122 (6/1/1998), "Cost Principles for Non-Profit Organizations"
5. OMB Circular A-133 (06/24/1997), "Audits of States, Local Governments, and Non-Profit Organizations" as implemented by Departmental Regulation 7 CFR 3050, "Audits of State and Local Governments" OMB Circular A-89 (8/17/1984), "Catalog of Federal Domestic Assistance"
6. 7 CFR 3017, Government Debarment and Suspension (Nonprocurement) and Government-wide Requirements for Drug-Free Workplace (Grants), and
7. 7 CFR 3018, New Restrictions on Lobbying.
8. 7 CFR 3019, Uniform administration requirements (Higher education, hospitals, and non-profit organizations"

APPENDIX D- Examples of Cost Share Calculations

Equation for Calculating Cost Share Requirement

(Federal FLP Share) X (0.333) = the minimum Non-Federal Contribution

OR

(Total Project Costs) X (0.75) = the maximum Federal Contribution

Principals to Guide Calculating the Cost-Share Requirements

- To calculate the cost share requirement, the Program Manager should use the Federal FLP contribution, and not the total project costs.
- The cost share requirement should be at least 33.3% of the total Federal FLP contribution towards the project, which will equal at least 25% of the total FLP project (Federal FLP contribution plus cost share).
- The Federal contribution (Forest Service's FLP plus all other Federal contributions) cannot exceed 75% of the total project costs (all cost requirements to complete the project, including Federal and non-Federal contributions).
- The non-Federal cost share portion cannot be used as cost share for another Federal program that also requires a cost share.

Example 1- The FLP is going protect Jane Smith's 3,000 acres tract. The total cost of protecting that land is $1 million.

Total Project Costs	*Federal FLP Contribution*	*Non-Federal FLP Contribution*	*Other Federal Contribution*	*Other non-Federal Contribution*

$1,000,000	$750,000	$250,000	$0	$0

. • Federal contribution cannot exceed $750,000; therefore, the Federal contribution is not greater than 75% of the total project costs.
. • The non-Federal cost share requirement is at least $250,000; therefore, FLP funds are adequately cost shared.

Example 2- John Doe Ranch is planning to conserve 6,500 acres of land. The total cost of protecting the land is $4 million. The Federal contribution, through FLP, will be $1,000,000, and the non-Federal contributors will provide $3,000,000, which includes a cost-share component for the FLP.

Total Project Costs	*Federal FLP Contribution*	*Non-Federal FLP Contribution*	*Other Federal Contribution*	*Other non-Federal Contribution*
$4,000,000	$1,000,000	$333,000	$0	$2,667,000

. • Federal contribution cannot exceed $3,000,000; therefore, the Federal contribution is not greater than 75% of the total project costs.
. • The non-Federal cost share requirement is at least $333,000; therefore, FLP funds are adequately cost shared.

Example 3-ABC Tree Company is planning to conserve 8,300 acres of land. Both theForest Service's FLP and the U.S. Fish and Wildlife Service (FWS) are contributing funds toward the project. Non-Federal money has been secured to cover the non-Federal cost share requirements for the FLP and FWS requirements, as well as to pay for additional project costs.

Total Project Costs	*Federal FLP Contribution*	*Non-Federal FLP Contribution*	*Other Federal Contribution*	*Other non-Federal Contribution*
$4,000,000	$1,000,000	$333,000	$1,000,000	$1,667,000

. • Federal contribution cannot exceed$3,000,000; therefore, the Federal contribution is not greater than 75% of the total project costs.
. • The non-Federal cost share requirement is at least $333,000; therefore, FLP funds are adequately cost shared.
. • FLP cost share component cannot be the same as the FWS cost share component.

APPENDIX E- Information to Facilitate Landowner Participation

Landowners who wish to participate in the program may be asked to provide the following information.

1. Name, address and phone number of applicant landowner.
2. All other owners of record for this tract, and their addresses.
3. Name, address and phone number of authorized agent representing landowner(s) if applicable.
4. Location of property.
5. If the landowner intends to reserve rights to forestry uses or other resource

management activities, a copy or reference to the State approved landowner Forest Stewardship Plan or multi-resource management plan.

6. List of the significant scenic, natural, recreational, wildlife, timber and other resource values contained on the property.
7. Identification of all dams, dumps or waste disposal sites on the property.
8. Signed statement giving the FS and State lead agency permission to enter the property for review and appraisal purposes.
9. Legal description.
10. List any encumbrances or liens existing on the property including, but not limited to contracts, leases, or outstanding rights not of record.
11. Copy of plat or survey map of the property, if existing. If only a portion of the property is being offered, identify it on a plat showing the portion offered in the context of the entire tract.
12. Tract acreage and total number of acres of forests and cleared/open land.
13. List of existing permanent improvements on the tract, including houses, barns, lakes, ponds, dams, wells, roads, and other structures, and total number of acres occupied by improvements.

APPENDIX F- Sample Content of a Forest Stewardship Plan

Below is information from the Forest Stewardship Program's *National Standards and Guidelines*. Please also refer to the Forest Stewardship Program's *Planning for Forest Stewardship: A Desk Gui*de as well as States' Statewide Forest Stewardship Plans for additional information on Forest Stewardship Plans.

Landowner Forest Stewardship Plans must:

- be prepared or verified, as meeting the minimum standards of a forest stewardship plan, by a professional resource manager.
- identify and describe actions to protect, manage, maintain and enhance relevant resources listed in the law (soil, water, range, aesthetic quality, recreation, timber, water, and fish and wildlife) in a manner compatible with landowner objectives.
- be approved by the State Forester or a representative of the State Forester.
- involve the landowner in the plan development by setting clear objectives and should understand clearly the completed plan.

A well prepared plan will:

- Clearly state landowner objectives.
- Have a cover page.
- Provide for authorship and/or signature lines within the document.

The plan preparer should consider and evaluate resource elements present and include a brief description of those that are applicable and their importance to the ownership. Resource elements to be considered are:

- Soil Interpretations
- Water
- Range

- Aesthetic Quality
- Recreation
- Timber
- Fish
- Wildlife
- Forest Health
- Archeological, Cultural and Historical Sites
- Wetlands
- Threatened and Endangered Species

Management recommendations, or where appropriate, alternative strategies should be provided for those resource elements described. Prescriptions or treatments should be integrated and stand or site specific. An ownership map drawn to scale, or photo, to include vegetation cover types, stream and pond location with a legend will enable the landowner to implement the plan.
Landowners' understanding may be improved by including activity summaries and appendices. Appendices might include:

- Description of assistance available and incentive programs
- Educational materials
- A glossary of terms
- An explanation of applicable Federal, State and /or county regulatory programs, especially as they apply to:

a. Archeological, cultural and historical sites.
b. Wetlands.
c. Threatened and Endangered Species.

These last three items are covered by legislation other than the Cooperative Forestry Assistance Act of 1978, as amended by title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 2101, et seq.), but must be considered for Federally funded programs.

The professional resource manager should discuss the Forest Stewardship Plan with the landowner, following completion, to assure understanding.

APPENDIX G- Real Estate Record Keeping

Since Forest Legacy acquisitions are perpetual, record keeping is important. Each State shall maintain permanent records for all Forest Legacy properties. The following information is recommended to be maintained by the conservation easement holder:

A. Landowner information (name, address, phone)
B. Nomination form (including notification to landowner that property will not be purchased if negotiations do not result in amicable agreement)
C. Landowner Inspection Consent Agreement
D. Baseline documentation

E. Option agreement
F. Deed of Conservation Agreement
G. Additional warranty deeds, covenants, restrictions
H. Title Insurance Policy
I. Appraisal
J. Appraisal review
K. Forest Stewardship Plan or equivalent
L. Notification of county or local government
M. Closing statement
N. Copies of check or documentation of EFT or other form of payment
O. Copies of grant reimbursement or expenditure

The following items should also be maintained as part of the record:
1. Landowner correspondence
2. Evaluation criteria
3. Tracking/documentation of negotiation steps
4. State Forest Stewardship Coordinating Committee recommendation
5. Press release
6. Monitoring records/history

APPENDIX H- Required Qualifications of an Appraiser or Review Appraiser

A. Appraiser - In order to be a qualified appraiser for purposes of FLP appraisals, an individual must be:

1. a Federal land acquisition agency staff appraiser who
a. is certified as a general appraiser in compliance with OMB Bulletin 92-06, and
b. has completed training in application of the December 2000 edition of *Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA)** approved for appraiser continuing education credit in the State where the appraiser is certified, or

2. a nonfederal staff or fee appraiser who
a. is certified as a general appraiser in the state where the appraised property is located, or can obtain reciprocity or a temporary practice permit in the state where the appraised property is located, and
b. has, within the past 10 years, completed at least the minimum classroom hours of non-duplicative education prescribed for the certified general real property appraiser classification by the Appraisal Standards Board of The Appraisal Foundation, and
c. has completed at least 12 self-contained or summary appraisal reports of properties similar in scope and complexity to the appraised property in the preceding three years, and
d. has completed training in application of the December 2000 edition of *Uniform Appraisal Standards for Federal Land Acquisitions* approved for appraiser continuing education credit in the state where the appraiser is certified.

EXHIBIT "B"

The qualified appraiser shall prepare an appraisal report in compliance with the *Uniform Appraisal Standards for Federal Land Acquisitions* and supplemental written appraisal instructions issued by the client. Federal land acquisition agencies are the member agencies of the Interagency Land Acquisition Conference.

B. Review Appraiser- In order to be a qualified review appraiser for purposes of FLP appraisals, an individual must be:

1. a Federal land acquisition agency staff appraiser who
a. is certified as a general appraiser in compliance with OMB Bulletin 92-06, and
b. holds specific delegated authority to review and approve or recommend appraisals for agency use, and
c. has completed training in application of the December 2000 edition of UASFLA* approved for appraiser continuing education credit in the State where the reviewer is certified, or

2. a nonfederal staff or fee appraiser who
a. is certified as a general appraiser in the State where the appraised property is located, or can obtain reciprocity or a temporary practice permit in the state where the appraised property is located, and
b. has, within the past 10 years, completed at least the minimum classroom hours of non-duplicative education prescribed for the certified general real property appraiser classification by the Appraisal Standards Board of The Appraisal Foundation and at least 32 classroom hours of approved training in appraisal review, or otherwise demonstrates competency in appraisal review in compliance with the Competency Rule of the *Uniform Standards of Professional Appraisal Practice (USPAP)*, and
c. has completed at least 12 self-contained or summary appraisal reports of properties similar to the appraised property in the preceding three years or at least 12 technical appraisal review reports for appraisal reports of properties similar in scope and complexity to the appraised property in the preceding three years, and
d. has completed training in application of the December 2000 edition of *Uniform Appraisal Standards for Federal Land Acquisitions* approved for appraiser continuing education credit in the state where the reviewer is certified.

The qualified review appraiser shall prepare a technical appraisal review report that includes a determination of whether the appraisal report under review complies with the *Uniform Appraisal Standards for Federal Land Acquisitions*.

Federal land acquisition agencies are the member agencies of the Interagency Land Acquisition Conference.

*The seminar, *Federal Land Exchanges and Acquisitions: Appraisal Issues and Applications*, offered by the American Society of Farm Managers and Rural Appraisers and the Appraisal Institute is the only acceptable substitute for UASFLA training.

EXHIBIT "B"

APPENDIX I- Requirements and Suggestions for Conservation Easements and Deeds

The Purpose and Authority and Reversion clauses are required in all FLP easements and deeds. Below are examples of language that States have used to meet that requirement:

A. Purpose and Authority Clause

Example 1:

WHEREAS, the Conservation values of the Property are consistent with the goals of the Forest Legacy Program and the establishment of this conservation easement will provide public benefits by:

preventing future conversions of forest land and forest resources; protecting and enhancing water quality and water supplies; protecting wildlife habitat and maintaining
habitat connectivity and related values to ensure biodiversity; protecting riparian area;
maintaining and restoring natural ecosystem functions; and maintaining forest sustainability and the cultural and economic vitality of rural communities.

WHEREAS, the specific Conservation Values of the Property are documented in an inventory of relevant features of the Property. The data and explanatory text are presented in the Baseline Documentation Report, dates _____, which consists of reports, maps, photographs, and other documentation that the parties agree to provide.

This Easement acquisition is authorized by the Cooperative Forestry Assistance Act of 1978, as amended by section 1217 of the Food, Agricultural, Conservation and Trade Act of 1990 (104 Stat. 3528; 16 U.S.C. Section 2103c).

Example 2:

The purpose of this easement is to effect the Forest Legacy Program in accordance with the provisions of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. – 2103c) as amended, on the herein described land, which purposes include protecting environmentally important forest areas that are threatened by conversion to non-forest uses and for promoting forest land protection and other conservation opportunities. The purposes also include the protection and preservation of important scenic, cultural, fish, wildlife and recreational resources, riparian areas, and other ecological values, and to ensure that the Property is available for the sustainable and cost effective harvesting of forest products in a silviculturally sound manner, all of which meet the objectives of the Forest Legacy Program. The purposes also include encouragement of management for and the production of economically sustainable and commercially viable forest products consistent with the other purposes of this easement and also include the long-term protection of the Conservation Property's capacity to

produce economically valuable forestry products, and the encouragement of management of the property for industrial or commercial forestry only if consistent with the other purposes of this Conservation Easement.

The Parties agree that the purpose of this easement is also to assure that the Property herein described as Schedule "A" and hereby encumbered as set forth in Schedule "B" will be retained forever in its existing natural, scenic and forested condition and to prevent any use of the Property that will significantly impair or interfere with the conservation values of the Property. The Grantor intends that this easement will confine the use of the Property to such activities specifically enumerated herein which are consistent with the overall purposes of the easement by protecting the following particular values of the easement area: specifically the scenic, cultural, fish, wildlife and recreational resources, riparian areas and similar ecological values.

Example 3:

WHEREAS, the clearly delineated open space conservation goals and objectives as stated in Forest Legacy Program pursuant to Section 1217 of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 USC Section 2103C) which was created "to protect environmentally important private forest lands threatened with conversion to non-forest uses" has awarded a Forest Legacy grant in to the Grantors for purchase of a portion of the value of the Easement herein conveyed for a conservation easement on forestal, agricultural, and open space land.

Example 4:

The purpose of this easement is to effect the Forest Legacy Program in accordance with the provisions of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 2103c) on the herein described land, which purposes include protecting environmentally important forest areas that are threatened by conversion to nonforest uses and for promoting forest land protection and other conservation opportunities. The purposes also include the protection of important scenic, cultural, fish, wildlife and recreational resources, riparian area, and other ecological values.

Example 5:

The purpose of this conservation easement is to restrict the exercise of all development rights, residential, commercial or otherwise, on the easement area and to protect the scenic and recreational values of said easement area from conversion to non-forest uses while at the same time allowing for the use of the area for commercial forestry and public recreation purposes consistent with the stated purposes, standards and general intent expressed in Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 USC 2103c) and the requirements of Section 7 for the Forest Legacy Program.

B. Reversion Clause:

EXHIBIT "B"

The Easement Holder acknowledges that this Easement was acquired with Federal funds under the Forest Legacy Program (P.L. 101-624; 104 Stat. 3359) and that the interest acquired cannot be sold, exchanged, or otherwise disposed, except as provided in Section 5.A, unless the United States is reimbursed the market value of the interest in land at the time of disposal. Provided, however, the Secretary of Agriculture may exercise discretion to consent to such sale, exchange, or disposition upon the State's tender of equal valued consideration acceptable to the Secretary.

APPENDIX J- Sample Content for Baseline Documentation

The following list has been modified from the Checklist included in the Land Trust Alliance and Trust for Public Land's *The Conservation Easement Handbook* (1988).

1. Cover Page
- including name and location of property, signature of the author/collector and date

2. Table of Contents

3. Owner Acknowledgement of Condition (see Treas. Reg. Section 1.170A-14(g)(5)(i)(D).

4. Background Information
- Ownership information (name, address, and phone number of property owner)
- Historical information on the donation/acquisition (brief chronological description of events that led to the protection of the property)
- Summary of easement provisions (specific prohibitions, restrictions, retained rights, as derived from the language of the easement document)
- Purpose of easement
- Evidence of the significance of the protected property, as established either by the government policy (include copies of documents) or by the long-term protection strategy developed by the grantee
- Corporate or agency resolution accepting gift (minutes of the meeting at which a gift is accepted or acquisition approved are adequate)

5. Legal Condition
- A copy of the signed, recorded easement document
- An assessor's parcel map
- A clear title statement or preliminary title report, noting any liens against the property that could compromise its natural qualities or invalidate the easement
- Copies of any other relevant easements or water rights associated with the property

6. Ecological Features
- A general description of the ecological features that the easement seeks to protect, such as forest and plant communities, soil characteristics, and habitat.
- The Forest Stewardship Plan should be used as a guide to determine what information is needed.
- An inventory of rare, endangered, and/or threatened species and habitat found on the property

EXHIBIT "B"

. • Reports from wildlife biologists or other specialists that document the status of significant natural elements

7. Agricultural Features

. • Intensity of grazing (can be determined by experts and expressed in "animal units" per acre) and farming

. • Level of pesticide use

8. Scenic Features

. • Official policies citing property's scenic value

. • Number of people who frequent nearby public places (roads, trails, parks) from which they can view property

9. Archeological, Cultural and Historical Features

• Archeological, cultural and historical sites and resources found within the property, with a focus on those resources that the easement seeks to protect.

10. Human Created Features

. • Improvements (structures, trails, fences, wells, power lines, pipelines, irrigation systems, etc.)

. • Recreation/tourism attractions

. • Trespass damage and disturbed land (stray animals, introduced species evidence of vehicular trespass, etc.)

11. Photographs

. • Aerial photos, if appropriate

. • On-site photos (be sure to record key photo points, record distance and azimuth from structures or other fixed points, and sign and date all photos)

12. Maps

. • A state map showing easement location

. • An 8 ½" X 11" section of a local road map showing easement location

. • The largest scale U.S. Geological Survey topographical map available (usually at a scale of 1:24,000, called a 7-1/2 minute scale), showing easement boundaries

13. Survey

• Surveys generally are not required, but may be helpful

EXHIBIT "B"

For additional Information on Baseline Documentation:

Land Trust Alliance. 2001. *Working Forest Conservation Easements.*

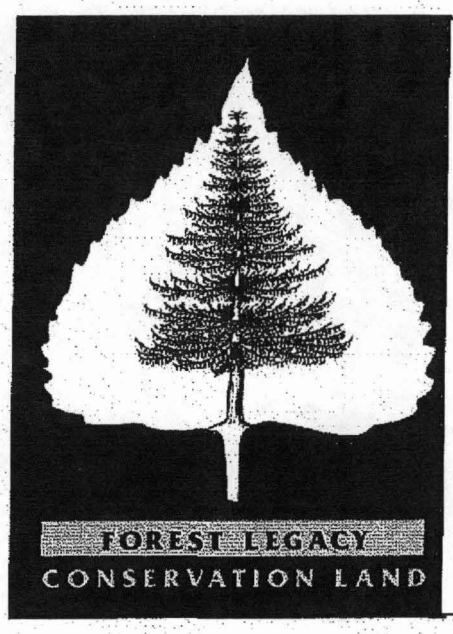
Land Trust Alliance and Trust for New Hampshire Lands. 1991. *The Conservation Easement Stewardship Guide.*

Land Trust Alliance and Trust for Public Land. 1988. *The Conservation Easement Handbook.*

APPENDIX K- Sample Graphics and Signs

The following are sample graphics for the Forest Legacy Program that can be used for signs, newsletters, articles, and other Forest Legacy Program related documents.

EXHIBIT "B"



Optional Text Box that can include:

- *Reference to FLP;*
- *Description of land conservation;*
- *Identify contact information;*
- *Address public access;*
- *Include participants' logos; or*
- *Other items.*

Exhibit "C"

FILED

2002 AUG 26 AM 10: 12

C. OKAWA, CLERK
THIRD CIRCUIT COURT
STATE OF HAWAII

ALAN MURAKAMI 2285
NATIVE HAWAIIAN LEGAL CORPORATION
1164 Bishop Street, Suite 1205
Honolulu, Hawaii 96813
Telephone: (808) 521-2302

JAMES M. DOMBROSKI 3622
LAW OFFICES OF JAMES M. DOMBROSKI
P.O. Box 751027
Petaluma, California 94975
Telephone: (707) 762-7807

STEVEN C. MOORE Pro Hac Vice
NATIVE AMERICAN RIGHTS FUND
1506 Broadway
Boulder, Colorado 80302
Telephone: (303) 447-8760
Attorneys for Plaintiff
PELE DEFENSE FUND

IN THE CIRCUIT COURT OF THE THIRD CIRCUIT

STATE OF HAWAII

PELE DEFENSE FUND, Plaintiff, vs. THE ESTATE OF JAMES CAMPBELL, DECEASED; W.H. MCVAY AND P.R. CASSIDAY, in their fiduciary capacity as Trustees under the Will and the Estate of James Campbell, Defendants.	CIVIL NO. 89-089 (Hilo) (Declaratory Judgment/Injunction) FINAL JUDGMENT; EXHIBITS "A" AND "B" Trial Date: August 2, 1994 Judge: Hon. Riki May Amano

FINAL JUDGMENT

Pursuant to the Findings of Fact and Conclusions of Law entered herein on AUG 26 2002, this court hereby enters JUDGMENT finally resolving all claims as to all

I hereby certify that this is a full, true and correct copy of the original on file in this office.

Clerk, Third Circuit Court, State of Hawaii

parties in favor of Plaintiff Pele Defense Fund (hereinafter PDF) and against the Estate of James Campbell as follows:

1. The Estate of James Campbell, its Trustees and each of their respective agents, employees, officers, heirs, personal representatives, successors, assigns, and beneficiaries, including successors in interest to 27,785.89 acres of land situate in the Puna District of the County of Hawai'i, State of Hawai'i (hereafter, the "land"), as described in the attached Exhibit "A", are permanently enjoined from excluding the following persons from entering the undeveloped portions of the land and using the developed portion for reasonable access to the undeveloped portions, (the developed areas are defined on Exhibit B attached hereto), to perform customarily and traditionally exercised subsistence and cultural practices:

(a) Hawaiian subsistence or cultural practitioners who are descendants of the inhabitants of the Hawaiian Islands prior to 1778;

(b) Person or persons accompanying Hawaiian subsistence or cultural practitioners described in (a); or

(c) Persons related by blood, marriage or adoption to Hawaiian subsistence or cultural practitioners described in (a).

2. For purposes of liability, all persons listed above are not invitees of the owner of the land.

3. Notwithstanding that this judgment includes a "permanent" injunction, the Estate of James Campbell and successor owners of the land, are not barred from and may seek to develop the undeveloped portions of the land consistent with applicable law; and PDF may oppose further development by lawful means.

4. The owner of the land shall give PDF notice of any and all proposed future development prior to application for any state or county permits, or the initiation of any development-related activity that does not require such permits. On January 1 of each calendar year, PDF shall inform the owner of the land of the name(s) and address of its designated officer(s) for purposes of this notice.

5. PDF shall submit a monitoring plan consistent with this Judgment to the owner of the land within six (6) months after entry of this Judgment. If the parties are unable to agree on the terms of the monitoring plan, either one or both parties may request Court instructions.

6. The Court shall retain jurisdiction to enforce this Judgment and the permanent injunction. If enforcement is necessary, any party in violation of the terms herein may be subject to contempt of court and sanctions, including but not limited to the payment of costs and reasonable attorneys' fees.

7. This judgment constitutes the final resolution of the all claims against all parties. There are no other outstanding claims or defenses which have been left unresolved.

DATED: Hilo, Hawaii, AUG 26, 2002.

SEAL

Riki May Amano
Judge of the above-entitled Court

APPROVED AS TO FORM:

Gary G. Grimmer
Robert E. Strand
Attorneys for Defendant Trustees of the
Campbell Estate
1470125.2

STATE OF HAWAII
SURVEY DIVISION
DEPT. OF ACCOUNTING AND GENERAL SERVICES
HONOLULU

C.S.F. No. 20,315

December 13, 1985

PORTIONS OF GOVERNMENT LANDS OF
MAKUU, KAOHE, KAIHU, KEHENA, KAPAAHU AND KAMAILI

PARCEL A

Puna, Island of Hawaii, Hawaii

Beginning at the west corner of this parcel of land and on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 47,769.67 feet South and 8228.41 feet West, thence running by azimuths measured clockwise from True South:-

1.	240° 05' 12"	24,288.19 feet	along Land Court Application 1053;
2.	345° 23' 30"	1348.57 feet	along the remainder of Government Lands;
3.	313° 00'	1221.60 feet	along the remainder of Government Lands;
4.	330° 16'	4682.10 feet	along the remainder of Government Lands;
5.	262° 03'	1960.70 feet	along the remainder of Government Lands;
6.	290° 02'	627.40 feet	along the remainder of Government Lands;
7.	314° 28'	4581.80 feet	along the remainder of Government Lands;
8.	314° 47'	744.40 feet	along the remainder of Government Lands;
9.	314° 12'	735.30 feet	along the remainder of Government Lands;
10.	315° 31'	1825.53 feet	along the remainder of Government Lands;
11.	40° 41'	13.81 feet	along the north side of 20-Foot Road;

EXHIBIT "A"

20,315

December 13, 1985

12.	338°	15'	14.99 feet along the west side of 20-Foot Road;
13.	60°	05' 12"	25,840.22 feet along Parcel B of Government Lands;
14.	140°	23'	16,220.18 feet along Parcel B of Government Lands to the point of beginning and containing an AREA OF 9,012 ACRES.

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

By: Raymond S. Nakamura
Raymond S. Nakamura
Land Surveyor

pt

Compiled from CSF 4777,
CSF 18,637 and Govt.
Survey Records.

50185-RW-3

STATE OF HAWAII
SURVEY DIVISION
DEPT. OF ACCOUNTING AND GENERAL SERVICES
HONOLULU

C.S.P. No. 20,316

December 13, 1985

PORTIONS OF GOVERNMENT LANDS OF
MAKUU, KAOHE, KAIMU, KEHENA, KAPAAHU AND KAHAILI

PARCEL B

Puna, Island of Hawaii, Hawaii

Beginning at the west corner of this parcel of land and at an angle on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 55,748.70 feet South and 22,096.90 feet West, thence running by azimuths measured clockwise from True South:-

1.	240°	05'	12"	16,000.00 feet	along Land Court Application 1053;
2.	320°	23'		16,220.18 feet	along Parcel A of Government Lands;
3.	240°	05'	12"	25,840.22 feet	along Parcel A of Government Lands;
4.	338°	15'		3262.76 feet	along the west side of the 20-Foot Road;
5.	340°	23'		19.26 feet	along the west side of the 20-Foot Road;
6.	342°	31'		250.51 feet	along the west side of the 20-Foot Road;
7.	337°	27'		156.17 feet	along the west side of the 20-Foot Road;
8.	347°	14'		271.04 feet	along the west side of the 20-Foot Road;
9.	348°	38'		331.85 feet	along the west side of the 20-Foot Road;
10.	353°	51'		125.10 feet	along the west side of the 20-Foot Road;
11.	359°	30'		1278.10 feet	along the west side of the 20-Foot Road;

60185 RV.3

C.S.P. No. 20,316

December 13, 1985

12.	358°	59'	2128.77 feet	along the west side of the 20-Foot Road;
13.	332°	38'	221.69 feet	along the west side of the 20-Foot Road;
14.	315°	33'	287.92 feet	along the west side of the 20-Foot Road;
15.	258°	17'	9.45 feet	along the south side of the 20-Foot Road;
16.	352°	29'	6915.35 feet	along Parcel C of Government Lands;
17.	56°	27'	1460.60 feet	along Lots 3-B and 3-A of Upper Kaimu Homesteads;
18.	39°	38'	3534.10 feet	along Lot 3-A of Upper Kaimu Homesteads, Grant 6571 to K. Kamakani, Grant 6330 to S. Kamelamela and Grant 6328 to D. Kamelamela;
19.	53°	04'	10,520.90 feet	along Government Lands;
20.	53°	31' 30"	9863.30 feet	along Grant 9275 to H. M. Holt, et al., Trustees under the Will and of the Estate of James Campbell, Deceased;
21.	148°	00'	4100.00 feet	along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
22.	116°	00'	8150.00 feet	along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
23.	126°	59'	25,105.30 feet	along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo, to the point of beginning and containing an AREA OF 16,843.891 ACRES.

Excepting and reserving therefrom all existing trails within the above-described Parcel B.

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

By: Raymond S. Nakamura
Raymond S. Nakamura
Land Surveyor

pt

Compiled from CSF 18,647
and other Govt. Survey
Records.

50185-RY-3

STATE OF HAWAII
SURVEY DIVISION
DEPT. OF ACCOUNTING AND GENERAL SERVICES
HONOLULU

C.S.F. No. 20,317

December 13, 1985

PORTIONS OF GOVERNMENT LANDS OF
KAMAILI, KEHENA AND KIKALA

PARCEL C

Puna, Island of Hawaii, Hawaii

Beginning at the east corner of this parcel of land, on the south boundary of Royal Patent 4475, Land Patent 8199, Land Commission Award 7713, Apana 13 to V. Kanamalu and at the north corner of Grant 7365 to J. K. Pau, the coordinates of said point of beginning referred to Government Survey Triangulation Station "KALIU" being 115.60 feet South and 9325.70 feet West, thence running by azimuths measured clockwise from True South:-

1.	46° 00'	982.00 feet along Grant 7365 to J. K. Pau;
2.	85° 00'	652.00 feet along Grant 7365 to J. K. Pau;
3.	58° 45'	1050.00 feet along Grant 7365 to J. K. Pau;
4.	73° 30'	1005.00 feet along Grant 7547 to Wm. K. Kaliihoomalu;
5.	45° 46'	1197.50 feet along Grant 7547 to Wm. K. Kaliihoomalu;
6.	139° 03'	50.08 feet along the north side of 50-Foot Road;
7.	45° 46'	1064.16 feet along the west side of 50-Foot Road;
8.	16° 10'	2051.31 feet along the west side of 50-Foot Road;
9.	38° 34'	1319.67 feet along the west side of 50-Foot Road;
10.	323° 16'	2381.65 feet along the south side of 50-Foot Road;
11.	270° 00'	981.59 feet along the south side of 50-Foot Road;

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C.S.F. No. 20,317

December 13, 1985

12. 316° 30' 1493.59 feet along the south side of 50-Foot Road to the northwest side of Upper Puna Road;

13. Thence along the northwest side of Upper Puna Road, the direct azimuth and distance being: 27° 43' 20" 4458.54 feet;

14. 55° 41' 15" 171.71 feet along the northwest side of Upper Puna Road;

15. Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 150.00 feet, the chord azimuth and distance being: 79° 01' 15" 118.82 feet;

16. 102° 21' 15" 518.59 feet along the northwest side of Upper Puna Road;

17. Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 250.00 feet, the chord azimuth and distance being: 77° 01' 15" 213.94 feet;

18. 51° 41' 15" 284.74 feet along the northwest side of Upper Puna Road;

19. Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 475.00 feet, the chord azimuth and distance being: 55° 01' 15" 55.24 feet;

20. 58° 21' 15" 354.39 feet along the northwest side of Upper Puna Road;

21. Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 450.00 feet, the chord azimuth and distance being: 50° 46' 15" 118.77 feet;

22. 135° 50' 1250.91 feet along Grant 7731 to L. K. Swain;

23. 157° 30' 3467.50 feet along Grant 7593 to Louisa Swain, Grant 7478 to L. E. Blaisdell and the northeast end of 50-Foot Road;

24. 127° 35' 2173.00 feet along Lot III-B of Upper Kaimu Homesteads;

25. 172° 29' 6915.35 feet along Parcel B of Government Lands;

26. 258° 17' 139.94 feet along the south side of 20-Foot Road;

27. 244° 12' 614.60 feet along the south side of 20-Foot Road;

50185 RV-3

C.S.F. No. 20,317

December 13, 1985

28.	195°	08'	397.80 feet along the south side of 20-Foot Road;
29.	254°	12'	783.69 feet along the south side of 20-Foot Road;
30.	254°	05'	1202.89 feet along the south side of 20-Foot Road;
31.	254°	48'	283.02 feet along the south side of 20-Foot Road;
32.	242°	35'	876.64 feet along the south side of 20-Foot Road;
33.	245°	28'	581.05 feet along the south side of 20-Foot Road;
34.	242°	17'	539.85 feet along the south side of 20-Foot Road;
35.	246°	20'	20.81 feet along the south side of 20-Foot Road;
36.	240°	31'	1658.87 feet along the south side of 20-Foot Road;
37.	240°	47'	707.62 feet along the south side of 20-Foot Road;
38.	309°	05'	1550.70 feet along R.P. 4475, R.P. 6883, L.P. 8200, L.C.Aw. 7713, Ap. 14 to V. Kamamalu;
39.	296°	22'	753.00 feet along R.P. 4475, R.P. 6883, L.P. 8200, L.C.Aw. 7713, Ap. 14 to V. Kamamalu;
40.	286°	00'	2750.00 feet along R.P. 4475, L.P. 8199, L.C.Aw. 7713, Ap. 13 to V. Kamamalu to the point of beginning and containing an AREA OF 1930 ACRES, MORE OR LESS.

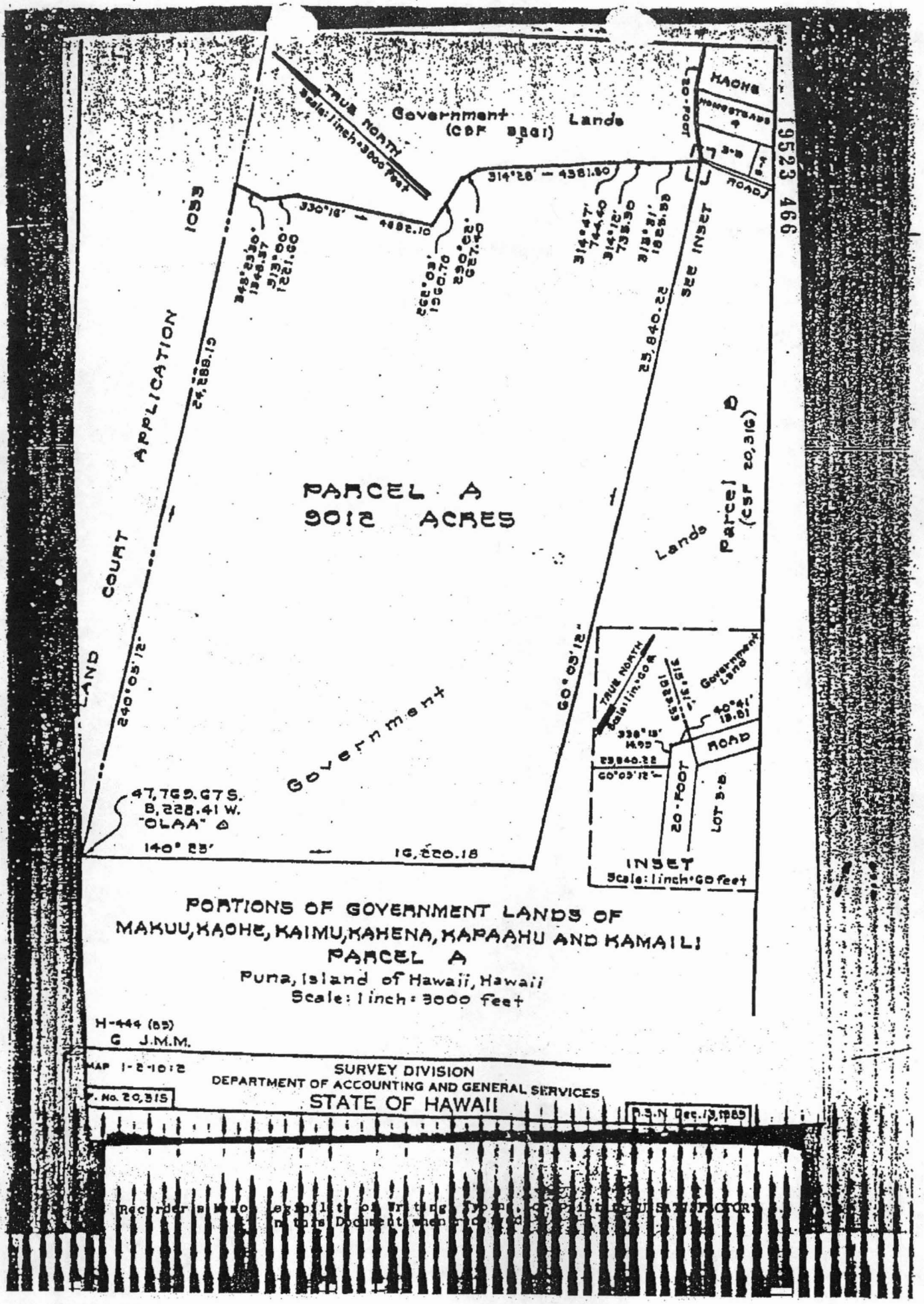
Excepting and reserving therefrom all existing trails within the above-described Parcel B.

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

By: Raymond S. Nakamura
Raymond S. Nakamura
Land Surveyor

Compiled from CSF 9446
and Govt. Survey Records.

pt



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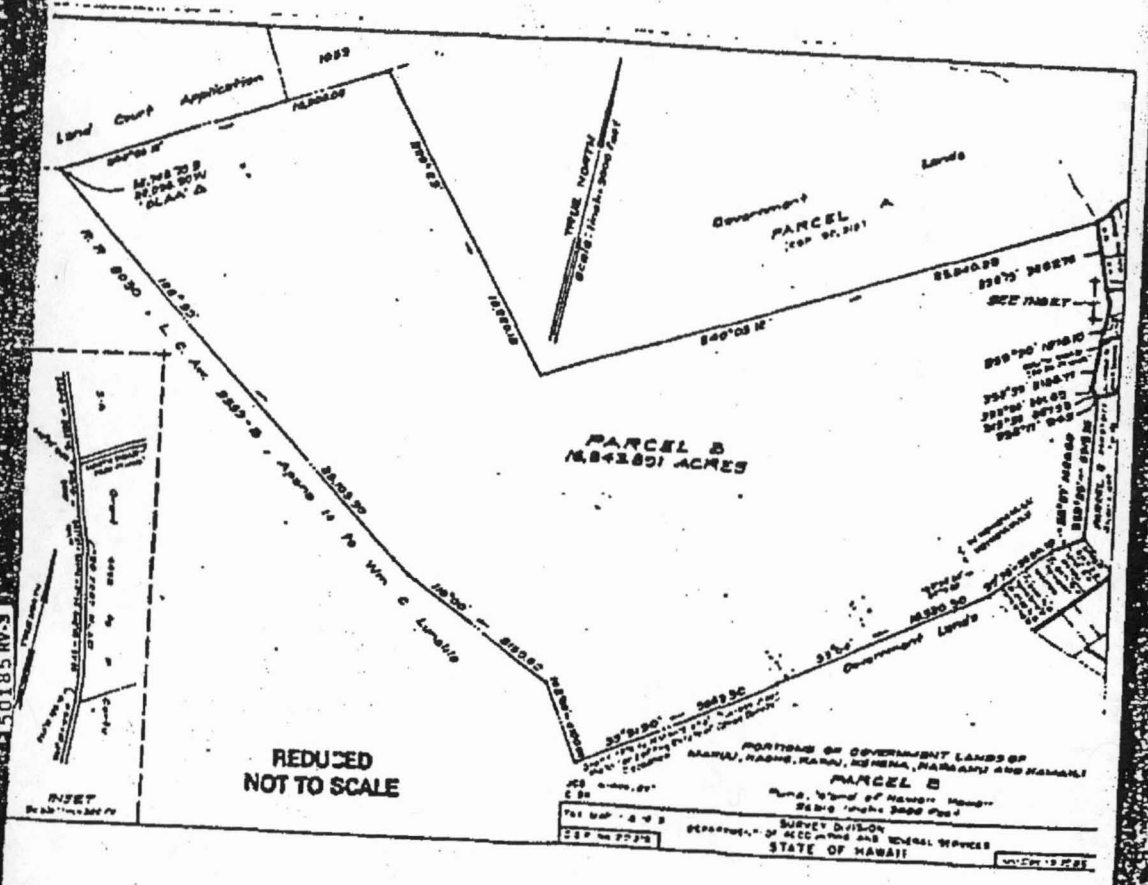

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Recorder's Memo: Legibility of Writing, Typing or Printing Unsatisfactory in this Document when Received.

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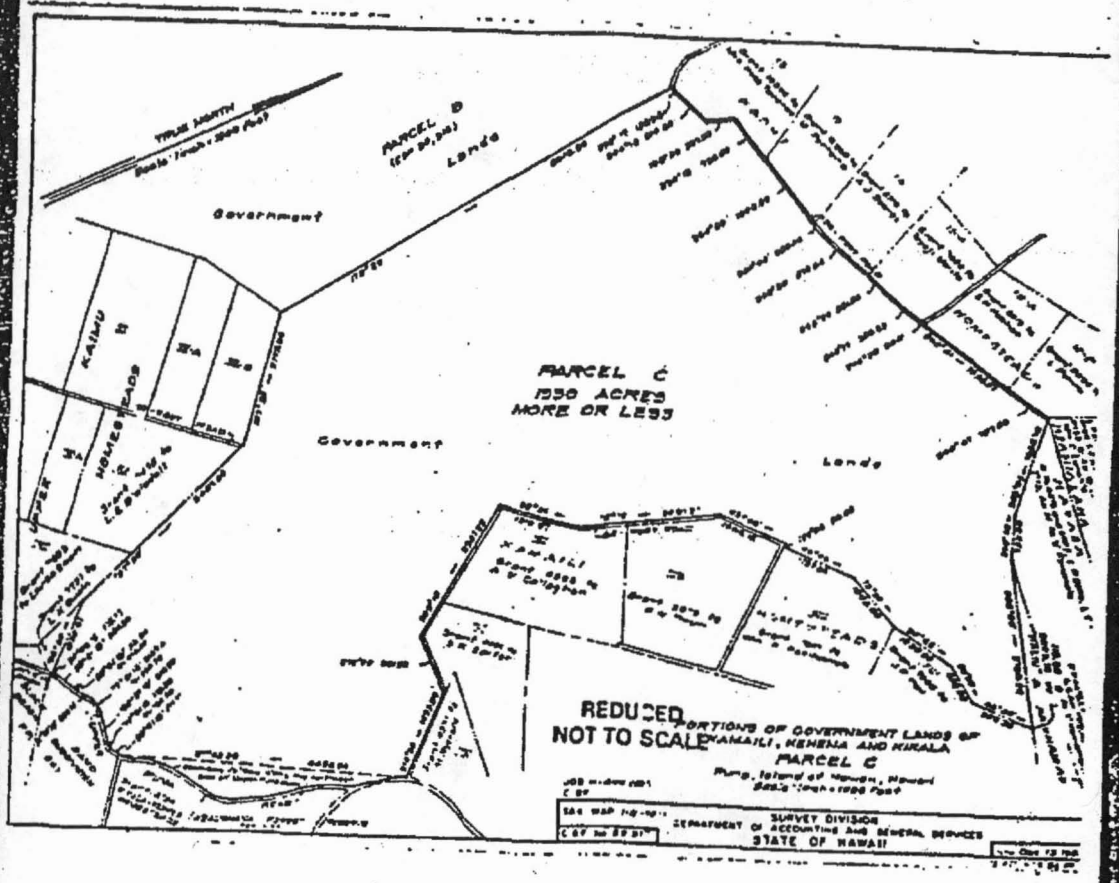

50185 RV-3

Recorder's Memo: Legibility of Printing, Typing, or Printing Unsatisfactory in this Document when received.

EXHIBIT "B"

DEVELOPED AREAS

The developed areas as of January 1, 2001, are the access road, geothermal drill sites and areas cleared for geothermal drill sites.

EXHIBIT "D"

Wao Kele o puna Operations and Management Funding Scenarios:

1). Minimal operations cost:

Minimal Signage for safety	$3000
ANNUALLY:	
- Basic peripheral Invasive Species Control-	$2000/yr
- DLNR Vehicle Usage-	$2000/yr
- Fire Pre-suppression-	$1000/yr
- Endangered Species Mgmt-	$5000/yr
- Basic Field Staff Time-	$4000/yr
- Misc. expenses- cement, etc. as needed)	$3000/yr (fence materials, helicopter time,
- Access Improvements- and reforestation of cleared areas)	$8000/yr (trails and roads maintenance/repairs
- Administrative costs -	$10,000
- Utilization of DOFAW Base yard Office space	$5,000
- Minimal enforcement	$10,000
TOTAL	**$53,000**

2). Improved operations cost:

Minimal Signage for safety	$3000
Basic peripheral Invasive Species Control-	$2000/yr
- DLNR Vehicle Usage-	$2000/yr
- Fire Pre-suppression-	$1000/yr
- Endangered Species Mgmt-	$5000/yr
- Basic Field Staff Time-	$4000/yr
- Misc. expenses- cement, etc. as needed)	$3000/yr (fence materials, helicopter time,
- Access Improvements- and reforestation of cleared areas)	$8000/yr (trails and roads maintenance/repairs
- Administrative costs -	$10,000
- Utilization of DOFAW Base yard Office space	$5,000
- - Minimal enforcement	$10,000
- Fire suppression capacity	$10,000
- Management plan development	$30,000
- EA's	$20,000
- Expansion of hunting program	$10,000
- Establishment of permit system	$5,000
TOTAL	**$75,000 + $53,000 = $128,000**

3). **Ideal Operations Costs:**

Minimal Signage for safety	$3000
Basic peripheral Invasive Species Control-	$2000/yr
- DLNR Vehicle Usage-	$2000/yr
- Fire Pre-suppression-	$1000/yr
- Endangered Species Mgmt-	$5000/yr
- Basic Field Staff Time-	$4000/yr
- Misc. expenses-	$3000/yr (fence materials, helicopter time, cement, etc. as needed)
- Access Improvements-	$8000/yr (trails and roads maintenance/repairs and reforestation of cleared areas)
- Administrative costs -	$10,000
- Utilization of DOFAW Base yard Office space	$5,000
- Minimal enforcement	$10,000
- Fire suppression capacity	$10,000
- Management plan development	$30,000
- EA's	$20,000
- Expansion of hunting program	$10,000
- Establishment of permit system	$5,000
- Coordinator	$50,000
- Designated vehicle for Coordinator	$30,000
- Adequate enforcement	$20,000
TOTAL	**$100,000 + $75,000 + $53,000 = $228,000**
GRAND TOTAL	**$228,000**

Geothermal Working Group Report

Evaluating geothermal energy as the primary resource for baseload power in the County of Hawaii

01 January 2012

Geothermal Working Group Report

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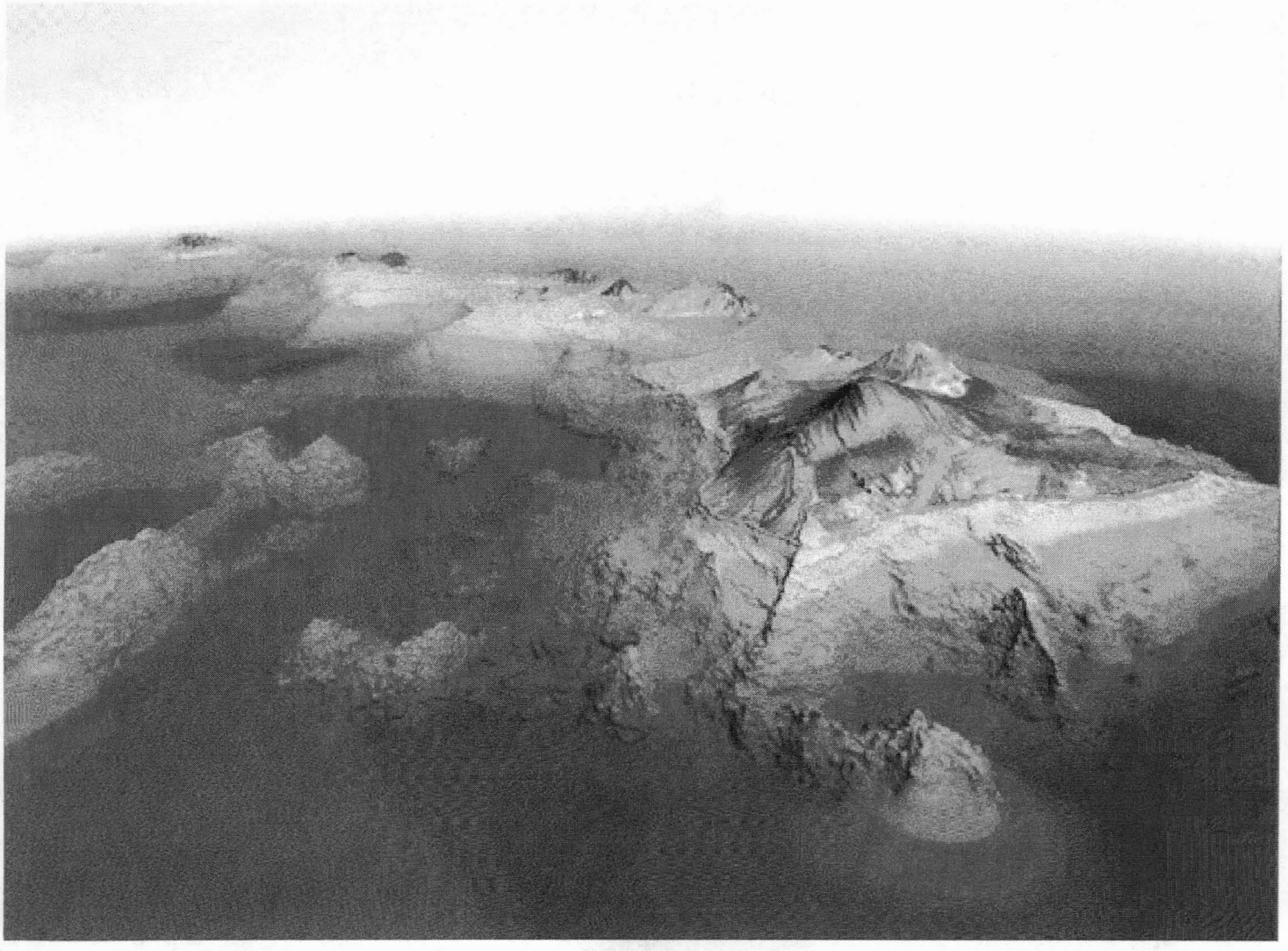

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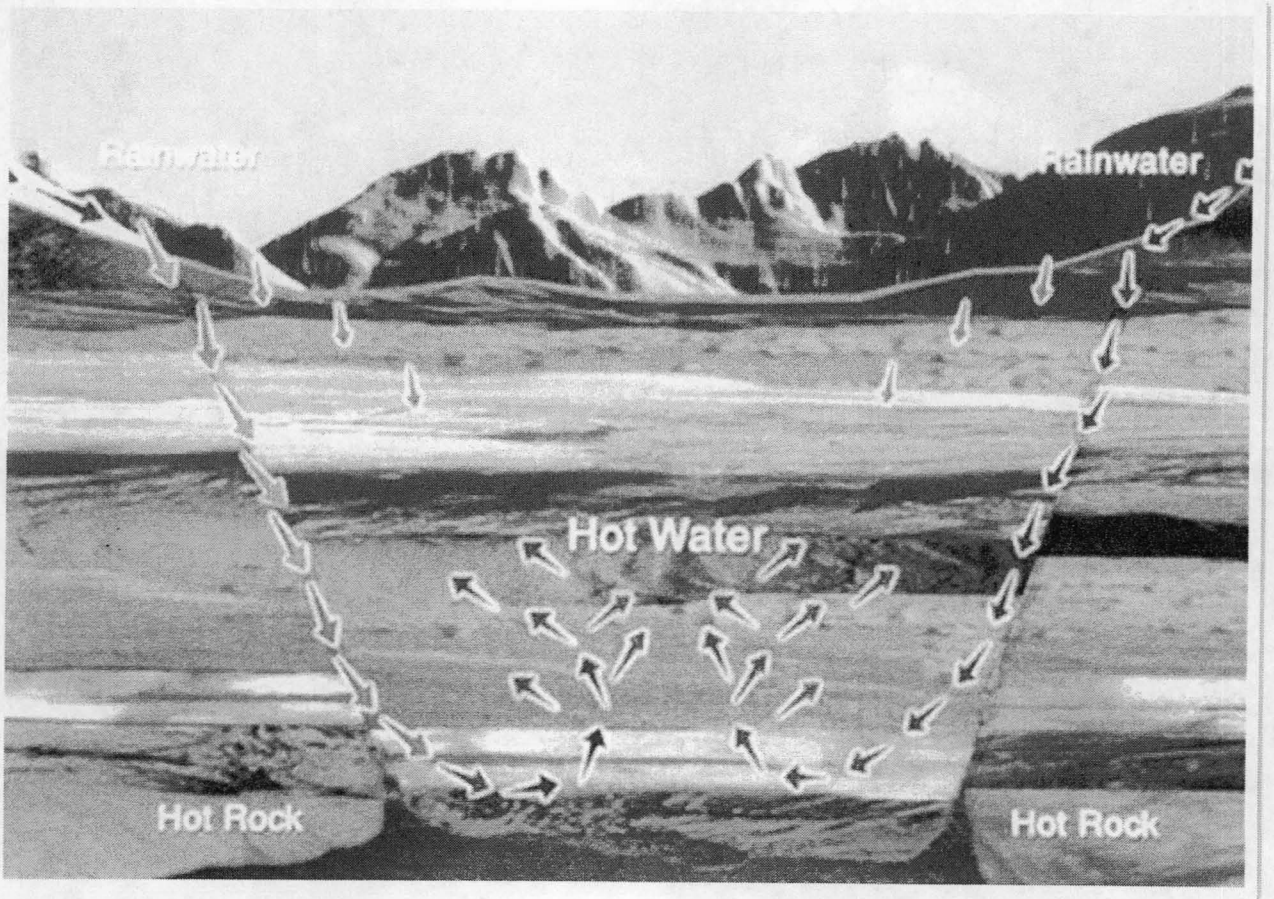

Natural geothermal reservoir

Appendices

Appendix A Senate Concurrent Resolution 99

Appendix B Composition of the Working Group

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Appendix F Q&A with HELCO

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Appendix N Development of Iceland's geothermal energy potential for aluminum production – a critical analysis by Jaap Krater and Miriam Rose

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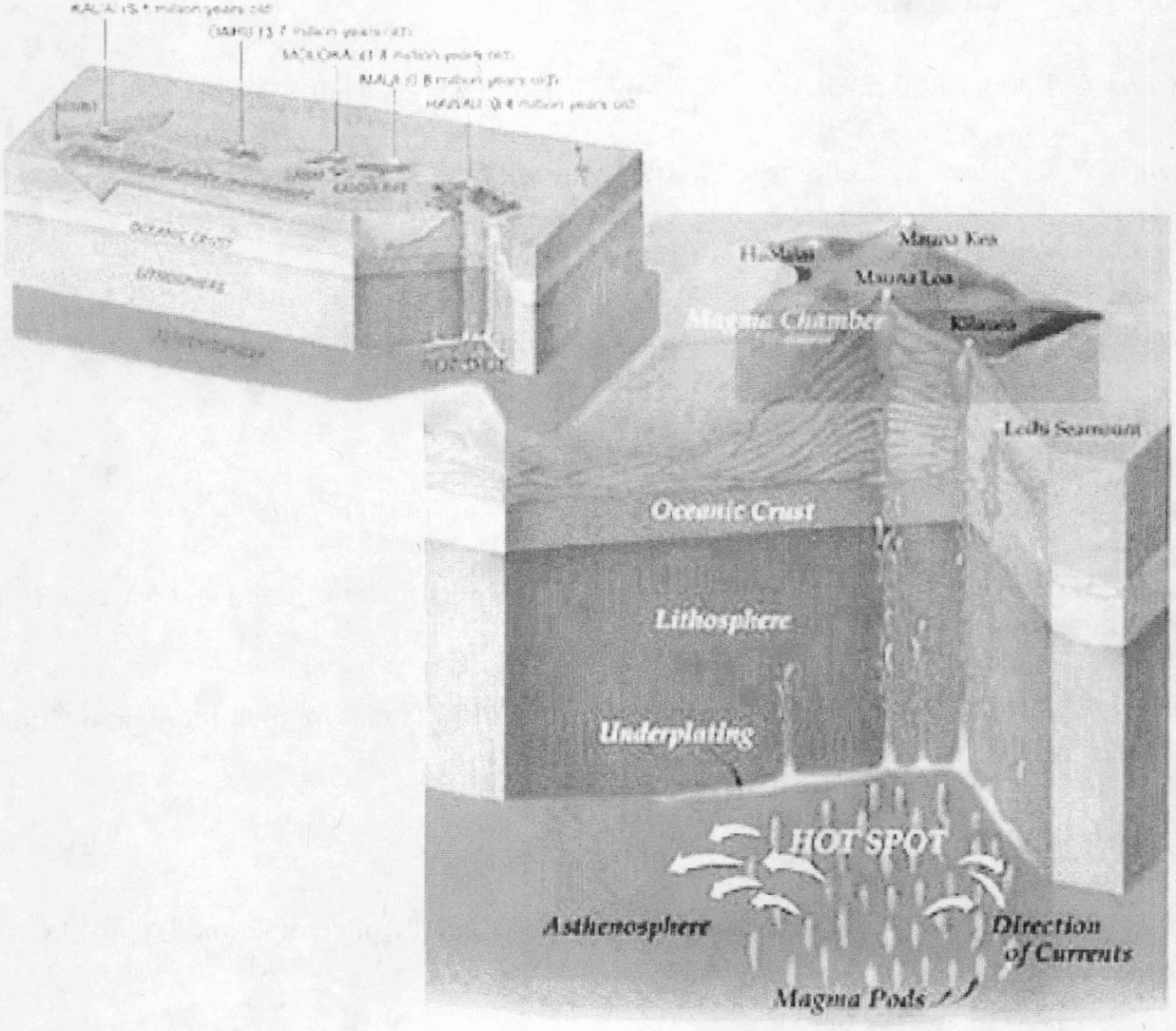
Appendix P The Economic, Environmental, and Social Benefits of Geothermal Use in Hawaii

I. Executive Summary

-2010

SCR 99 established the Geothermal Working Group to evaluate geothermal energy as the primary source of baseload power for electricity in the County of Hawaii. An analysis of technical data and of expert testimony provides convincing rationale to develop local renewable energy plants and transition away from the county's dependence on petroleum-fueled generators for baseload electricity. Each stage of development must consider public safety and environmental concerns. Funding for research is required to ensure that the transition never harms people, property, or wildlife and that a robust and reliable supply of energy is always available. It is critically important to the welfare of all Hawaii residents that we begin to develop local energy immediately.



Hawaii's geological access to Earth's energy

The Geothermal Working Group's principal findings:

- Geothermal is a renewable resource indigenous to the island of Hawaii that is dissociated from the price volatility of petroleum fuels.

- Geothermal can be a key component in a diversified energy portfolio for Hawaii County, both for the electrical grid and for transportation.

- In Hawaii, geothermal is a firm-energy resource at lower cost than fossil fuel.

- Developing multiple geothermal plants is the most prudent approach.

- Geothermal has the potential to supply baseload electricity; long term reliability and the ability to supply grid management services (currently supplied by conventional fossil-fueled power plants) must be demonstrated in order to consider geothermal as the primary energy resource.

- With geothermal power plants, agricultural fertilizers, hydrogen, oxygen, and business-enterprise power can be produced for off-peak rates during the hours of curtailed electrical demand.

Charging station for electric vehicles

II. SCR 99 and Corresponding Report Sections

BE IT RESOLVED *by the Senate of the Twenty-fifth Legislature of the State of Hawaii, Regular Session of 2010, the House of Representatives concurring, that the County of Hawaii is requested to establish, convene, and facilitate a working group to analyze the potential development of geothermal energy as the primary energy source to meet the baseload demand for electricity on the Big Island*

See:
Appendix A Senate Concurrent Resolution 99, Sponsor: Russell S. Kokubun
Appendix B Composition of the Working Group
Appendix C Geothermal Working Group Minutes

BE IT FURTHER RESOLVED *that the working group consist of eleven members with the Mayor of Hawaii County designating the chairperson, including:*

The Hawaii County Energy Coordinator, or designee;
One member designated by Hawaii Electric Light Company;
One member designated by the Big Island Labor Alliance;
One member designated by the Hawaii Island Economic Development Board, Inc.;
One member designated by the Chairperson of the Public Utilities Commission;
The Hawaii Island Office of Hawaiian Affairs Trustee, or designee;
One member designated by the Director of Business, Economic Development, and Tourism;
One member designated by the Chairperson of the Board of Land and Natural Resources;
One member who is a representative of a non-profit, environmental group to be selected by the President of the Senate;
One member who is a representative of a cultural organization to be selected by the Speaker of the House of Representatives; and
One member representing West Hawaii to be selected by the Mayor of Hawaii County;

See:
Appendix B Composition of the Working Group

BE IT FURTHER RESOLVED *that the working group consider the potential impacts of expanding geothermal energy production on native habitats, pristine forest environments, and native Hawaiian values and practices, and recommend mitigative measures to ameliorate any adverse impacts that may be caused by geothermal energy production expansion*

See:
Environmental Impacts

BE IT FURTHER RESOLVED *that the working group also consider what improvements may be required for the electricity transmission system and what funding may be available for such projects from the United States Department of Energy*

See:
Infrastructure and Engineering Considerations

BE IT FURTHER RESOLVED *that the working group is requested to include a feasibility and cost-benefit analysis of using geothermal energy as the primary energy source to meet baseload demand on the Big Island, including an analysis of community, environmental, and economic benefits*

See:
The Cost of Energy
Community Benefits
Royalties Disbursement

BE IT FURTHER RESOLVED *that any community benefits analysis include the possibility and feasibility of establishing a community benefits package that includes the distribution of royalties derived from geothermal energy production to impacted communities, and strategies to avoid passing costs onto the customer*

See:
Community Benefits
Royalties Disbursement
Appendix D Activities to Date
Appendix L Warranty Deed and Grant of Access Easement, July 11, 2006
Appendix M Memorandum of Agreement Between the Department of Land and Natural Resources, State of Hawaii and the Office of Hawaiian Affairs

BE IT FURTHER RESOLVED *that the working group is further requested to include a detailed accounting of the geothermal royalties collected by the State, the County of Hawaii, and the Office of Hawaiian Affairs, including how those entities distribute and use the royalties*

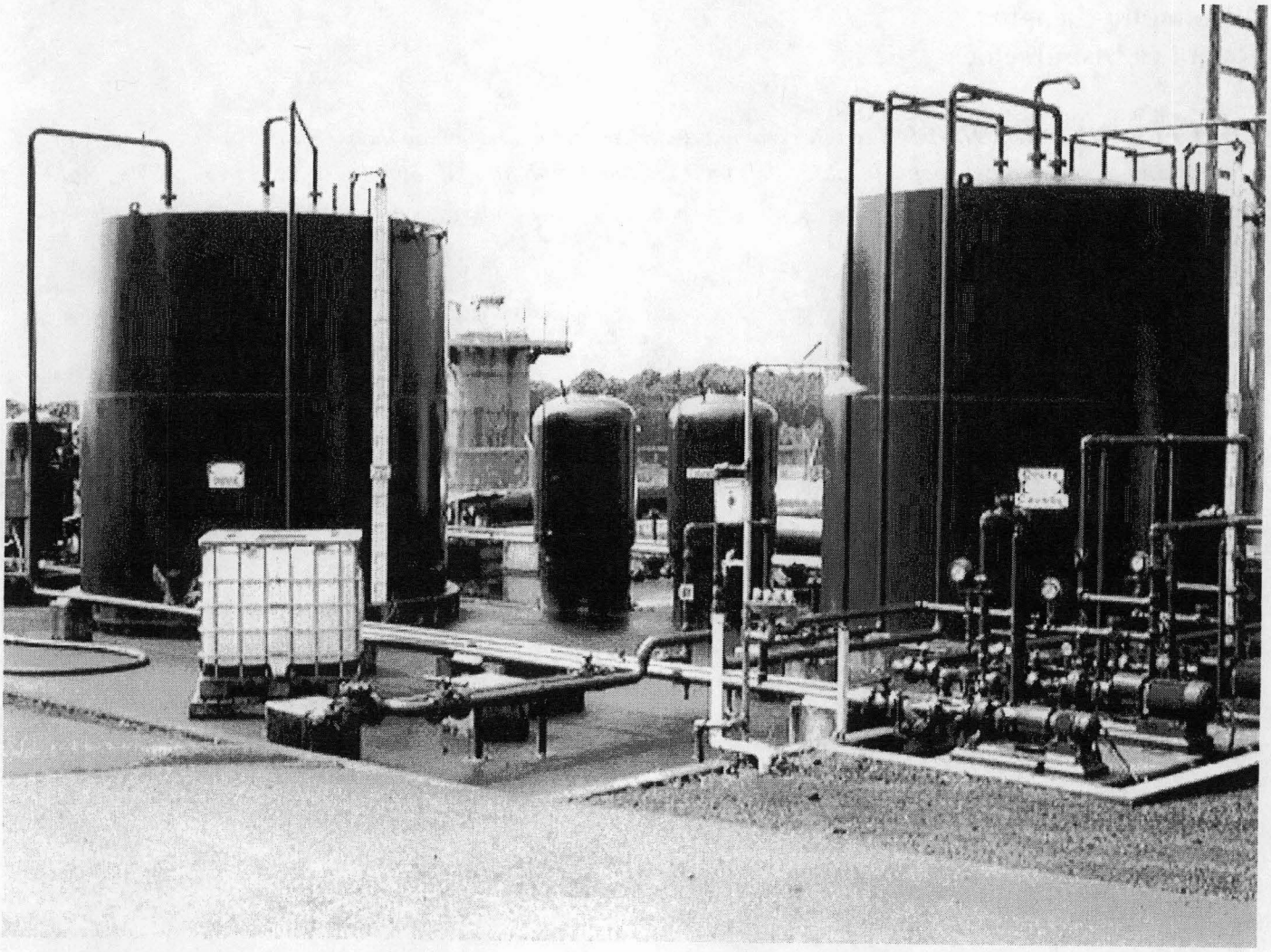
See:
Royalties Disbursement

BE IT FURTHER RESOLVED *that the County of Hawaii is requested to provide an interim report to the Legislature no later than twenty days prior to the convening of the 2011 Regular Session, and the final report of the working group to the Legislature no later than twenty days prior to the convening of the 2012 Regular Session*

See:
Geothermal Working Group Interim and Final Reports

BE IT FURTHER RESOLVED *that certified copies of this Concurrent Resolution be transmitted to the Governor, the Chairperson of the Board of Land and Natural Resources, the Director of the Department of Business, Economic Development, and Tourism, the Chairperson of the Office of Hawaiian Affairs, the Mayor of Hawaii County, the Chairperson of the Hawaii Island Economic Development Board, Inc., the Chairperson of the Public Utilities Commission, the President of the Hawaii Electric Light Company, and the President of the Big Island Labor Alliance*

Coordinated through Hawaii County Mayor's Office Administrative Services



Hawaii's geothermal power plant produces 30 megawatts of power

Overview

Geothermal energy can be developed to become the cheapest form of baseload power for Hawaii County. There are no importation or storage costs. Using geothermal as the primary source of baseload power will permit the county's businesses to be more competitive with the rest of the world. Using geothermal as the primary source of baseload power will also help folks on the lowest rungs of the economic ladder—those who struggle with the cost of services.

In addition to stability and affordability, geothermal can leave less of an environmental impact than the commercially-available baseload power sources of electricity. There are no greenhouse gases, emissions and no oil spill risks.

The lower rates of off-peak geothermal electricity encourage the production of ammonia locally. Ammonia is an efficient hydrogen carrier that can be used to power internal combustion engines and as an aid to local agriculture as fertilizer. Light-industry business parks constructed near geothermal energy plants can use excess heat as a resource for heating vegetable and tropical flower hothouses, drying wood, and drying fish.

Benefits of geothermal energy to the community include sharing in geothermal royalties. In accordance with state law, the geothermal royalties are paid directly to the Department of Land and Natural Resources who allocate the royalties in three ways:

1. Department of Land and Natural Resources receives 50%
2. County of Hawaii receives 30%
3. Office of Hawaiian Affairs (OHA) receives 20%

Potential adverse impacts are listed below:

- Interference with worship of the Goddess Pele
- Interference with certain Native Hawaiian practices
- Rainforest destruction
- Possible health and safety impacts
- Disruption of the way of life for nearby residents
- Hydrogen sulfide and other air quality issues
- Noise
- Increased strain on an inadequate infrastructure
- Impact on native fauna and flora

The amount of geothermal royalties paid to the State of Hawaii fluctuates each fiscal year, since power output and sales to HELCO vary.

FISCAL YEAR	TOTAL	STATE OF HAWAII	COUNTY OF HAWAII	OFFICE OF HAWAIIAN AFFAIRS
1995 & PRIOR	$788,611.86	$394,305.93	$236,583.56	$157,722.37
1996	$499,353.00	$249,676.50	$149,805.90	$99,870.60
1997	$546,431.00	$273,215.50	$163,929.30	$109,286.20
1998	$522,235.00	$261,117.50	$156,670.50	$104,447.00
1999	$426,698.00	$213,349.00	$128,009.40	$85,339.60
2000	$496,381.00	$248,190.50	$148,914.30	$99,276.20
2001	$717,658.00	$358,829.00	$215,297.40	$143,531.60
2002	$477,958.00	$238,979.00	$143,387.40	$95,591.60
2003	$82,295.00	$41,147.50	$24,688.50	$16,459.00
2004	$678,165.00	$339,082.50	$203,449.50	$135,633.00
2005	$969,980.00	$484,990.00	$290,994.00	$193,996.00
2006	$1,855,394.00	$927,697.00	$556,618.20	$371,078.80
2007	$1,839,083.00	$919,541.50	$551,724.90	$367,816.60
2008	$2,698,467.00	$1,349,233.50	$809,540.10	$539,693.40
2009	$3,137,486.99	$1,568,743.49	$941,246.10	$627,497.40
2010	$1,073,362.00	$536,681.00	$322,008.60	$214,672.40
Thru August 2011	$1,878,965.00			

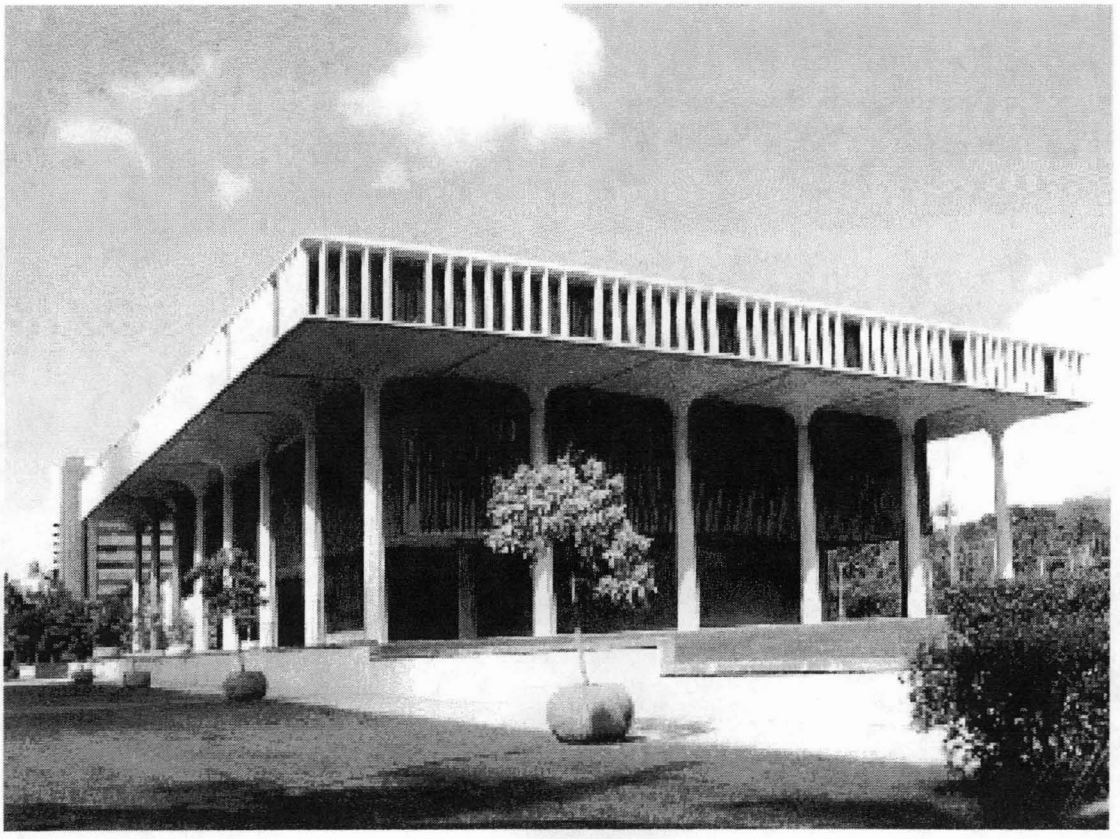
III. Geothermal Working Group Evaluations

The Geothermal Working Group advises a course of action that leads to energy independence and away from the dependence upon imported fuels. The Working Group advocates developing and producing a clean, renewable, and local energy portfolio that includes geothermal. Hawaiian Electric (HECO) vice president, Robbie Alm, wrote "Our state is 90 percent dependent on imported fossil fuels for all our energy needs. This is no longer sustainable. It threatens our energy and economic security and our environment.[1]"

There are no fossil fuel reserves in Hawaii. However, Hawaii does have natural and renewable energy resources. Using them can provide the means to lessen the impacts of an energy crisis.

Recently, HELCO performed high-level transmission studies to evaluate the expansion of geothermal generation. These studies provide a general appraisal of the transmission requirements for additional geothermal generation, but are not equivalent to the detailed interconnection studies required for specific projects.

[1] From PUC testimony, September 2011, see PUC.Hawaii.gov/dockets.



IV. Recommended Steps for Hawaii State Legislators

- Make the allocation of geothermal royalties more transparent to show how benefits come back to the community. Designate the records of the allocations to be public domain.

- Establish a community advisory board to offer suggestions to the DLNR about how royalties generated by geothermal power plants are spent. The advisory board should be members of the communities that host existing or future geothermal power plants and/or those who are most impacted by the development of geothermal energy.

- Encourage the DLNR to use geothermal royalties to identify promising geothermal sites and to further develop the resource.

- In light of the probability that oil will reach $200 per barrel (Lloyds of London), the legislature is requested to commission a study to show the economic impact of various prices of oil.

- Facilitate development of geothermal with a critical review of the geothermal permitting process, regulatory capabilities, and possible investment incentives.

Environmental Impacts

SCR 99 was mindful that geothermal energy development impacts adversely both the natural and cultural environment. It stated:

WHEREAS, previous geothermal development has raised sensitive issues regarding the impacts on native Hawaiian cultural and spiritual practices;

WHEREAS, Hawaii needs a sustainable energy market that strikes a balance between economic, community, and environmental priorities;

BE IT FURTHER RESOLVED that the working group consider the potential impacts of expanding geothermal energy production on native habitats, pristine forest environments, and native Hawaiian values and practices, and recommend mitigative measures to ameliorate any adverse impacts that may be caused by geothermal energy production expansion;

Potential adverse impacts are listed below:

- Interference with worship of the Goddess Pele
- Interference with certain Native Hawaiian practices
- Rainforest destruction
- Possible health and safety impacts
- Disruption of the way of life for nearby residents
- Hydrogen sulfide and other air quality issues
- Noise
- Increased strain on an inadequate infrastructure
- Impact on native fauna and flora

Hawaii laws say the exploration and development of geothermal resources can be permitted within conservation, agricultural, rural, and urban areas. That is because the vast majority of resources are located under volcanic rift zones and usually do not impact human activity on the surface. Because of volcanic hazards, geothermal potential is associated with predominantly rural areas most of the time and undeveloped lands where direct human impacts or occupation are minimal, such as the Wao Kele O Puna rainforest.

Industrialization of these rural or wilderness areas and the implementation of an industrial activity–the generation of geothermal power–is of major concern for those living adjacent to it or who value the biological diversity preserved in those areas.

1. The larger the quantity of geothermal energy developed, the larger the impacts to adjacent residents and the environment. Proponents of greatly expanded geothermal energy expound scenarios where major displacement of existing oil-fired electrical generation is achieved, with new high-energy input industries introduced on island to facilitate the transition. There has been no

analysis done by this Working Group on the environmental or social impacts of any large scale development scenarios.

2. It is apparent that under current assumptions, HELCO will not absorb more than another 10 to 20 MW of baseload geothermal energy in the near future (i.e. 2015). As stated, proponents of greatly expanded geothermal energy envision scenarios where total displacement of all oil-fired electrical generation (100 - 200MW or more of geothermal generated electricity) is practical, with a new high-energy input industry to absorb that energy until the electrical grid can be totally converted from oil-based fuels.

3. Prior to any expansion of geothermal facilities, members of this Working Group have asked that reviews of the air quality/hydrogen sulfide emissions rules, noise regulations relating to geothermal exploration, drilling operations, and production operations should be undertaken. Those are the environmental impacts that caused great alarm and objection in years past.

4. DLNR participation in future Working Groups is essential. They are a major influence in Hawaii's land use and management. They are tasked with geothermal subzone designation. That kind of review would be most beneficial in the education of potential "neighbors" on the slopes of Hualalai and/or the Kawaihae region.

5. Future review committees should seek input from DOH's regulatory divisions as well. They are ostensibly responsible for responding to neighbor complaints and overseeing air emissions and other pollutants. What is their current ability to handle and regulate and respond to emergency situations? What is their role during an emergency, either in Lower Puna or at a new geothermal site on the slopes of Hualalai and/or Kawaihae?

6. The Hawaii County Civil Defense and other County agencies play a role in the development of geothermal energy and mitigating its adverse environmental and social impacts. This Working Group did not interact with these County agencies. We encourage future Working Groups to do so.

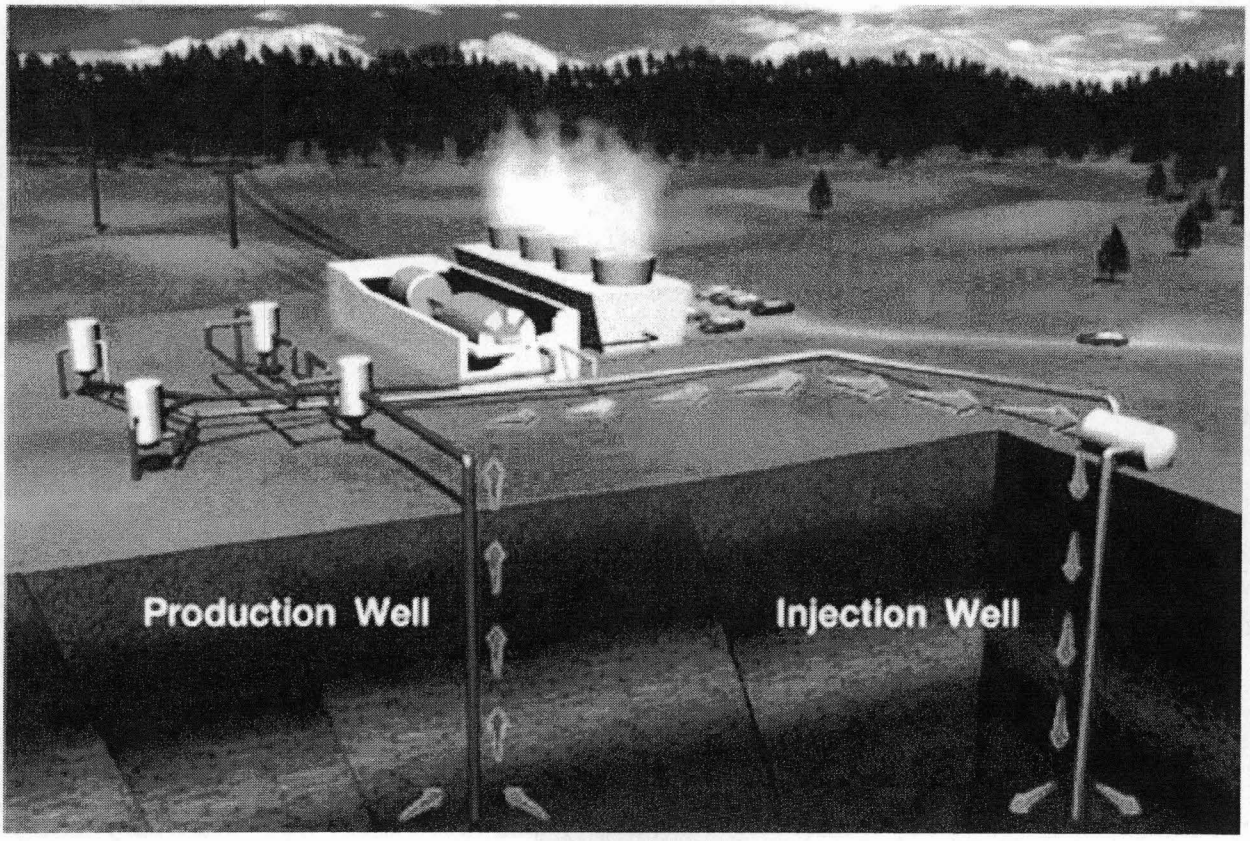
Since the environmental impacts are site specific, there can be no information on the impact without identifying the location of the resource or how it will be developed. The most critical issue is to identify the resources available. More testing is needed. The downside of the data available on Big Island's geothermal resources is that it is old and obtained using techniques that have been much improved in recent decades.

Resource Analysis and Impact Assessment

There are two projects the Working Group recommends be funded: first, testing and identifying specific locations that hold promise to be geothermal generation sites and, second, analyzing the impact of transition to geothermal upon the existing infrastructure. For example, shippers and dock workers may lose work importing supplies for petroleum-based plants. Funding for a study is needed and the Working Group recommends the legislation make it available.

A concern of neighbors to the geothermal plant in Puna is the need to plan for a possible malfunction in the plant's operation that might lead to a release of toxic gas. An Emergency Response Plan has been prepared and is updated from time-to-time. Copies of the ERP are distributed to all the responding agencies and available at the Pahoa Public Library. The working group recommends that the ERP be made available on-line for community review and information.

Some members of the Puna community insist that any expansion of PGV's capacity be done under the strictures of a contested case hearing. The Working Group is of the opinion that a robust environmental impact statement can mitigate community concerns. The contested case hearing is not recommended at this time.



Infrastructure and Engineering Considerations

Background Information

The electric transmission system on the Island of Hawaii is owned and operated by Hawaii Electric Light Company (HELCO), an investor-owned utility regulated by the Hawaii Public Utilities Commission. Hawaii Island has a land area of approximately 4,000 square miles with approximately 80,000 electric utility customers. The transmission system is primarily comprised of transmission lines built and operated at 69,000 volts. Currently, there are approximately 650 miles of transmission lines with 22 transmission substations on the Hawaii Island electrical grid.

HELCO's transmission system interconnects HELCO's major generation sites at Keahole (80.8 MegaWatts), Kanoelehua (55.2 MW), Puna (34.5 MW), Shipman (13.5 MW), and Waimea (7.5 MW), with major independent-power-producers at Hamakua Energy Partners L.P. (HEP - 60 MW), and Puna Geothermal Venture (PGV - 30.0 MW). Other *as-available* generation sites are also interconnected to HELCO's transmission system: Puueo Hydro (3.25 MW), Wailuku River Hydro (12.1 MW), Tawhiri Power LLC (Pakini Nui) Windfarm (21.0 MW), and Hawi Renewable Development, Inc. (10.56 MW). In addition, four dispersed-diesel units (1 MW each) are interconnected to the distribution system at the Panaewa substation, Kapua substation, Ouli substation, and Punaluu substation.

The majority of the firm-capacity power plants on HELCO's system are located on the eastern half of the island, while approximately half of the customer loads are on the western half of the island. HELCO firm-capacity power plants at Kanoelehua, Puna, and Shipman, and firm-capacity independent-power-producer plants at PGV and HEP are located on the eastern half of the island. HELCO firm-capacity power plants at Keahole and Waimea are located on the western half of the island. Net power generally flows from the power plants in the East to the load centers near Kailua-Kona on the westside.

There are four basic transmission routes for this cross-island power flow. Two transmission routes follow the path of Saddle Road between Mauna Kea and Mauna Loa, then through the South Kohala area on to Kailua-Kona. A third transmission route traverses from Hilo, through the northeast part of the island along the Hamakua Coast, through Waimea Town and then through the South Kohala area on to Kailua-Kona. The fourth route traverses from Hilo, through the Volcano area, through the South Point area, continuing through South Kona on to Kailua-Kona.

The HELCO transmission network allows for redundancy in the event of an outage to a line or system component. HELCO uses single-contingency criteria for the planning of its transmission system, meaning the system is designed to maintain normal voltages and line loading in the event a

single transmission line goes out-of-service. However, HELCO's transmission system is not designed to maintain normal voltages and line loadings should simultaneous outages occur in two or more transmission lines. Because such multi-line outages can result in large and serious system disturbances, proper operation and maintenance of HELCO's transmission system is vital to providing reliable service.

Transmission System Upgrade Study

A high level review of the transmission system upgrades required to interconnect additional geothermal power plants on Hawaii Island was done by Hawaii Electric Light Company. Two geothermal expansion scenarios were reviewed: one evaluated the addition of 50 MWs of geothermal energy from the East Rift zone and the second evaluated the addition of 50 MWs of geothermal energy on Hualalai on the West Side of Hawaii Island.

The evaluation concluded that for a 50 MW expansion on the East Rift zone, an additional transmission line from the new facility to Hilo, and an additional cross-island transmission line from the East side of the island to the West side would be required. For a 50 MW expansion near Hualalai, transmission lines from the new facility to existing transmission facilities on the West side of the island would be required but another cross-island transmission line would not be required.

HELCO's high-level transmission studies provide a general evaluation of transmission requirements for additional geothermal generation, but are not equivalent to the detailed interconnection study required for a specific project. More detailed interconnection studies would be performed at the time a geothermal-development project was identified and more specific size and location information was available. Cost estimates for interconnections would be developed at that time.

Note Regarding the Next Section of the Report

Many of the issues discussed in the next section, The Cost of Energy, will be evaluated in detail as part of HELCO's next Integrated Resource Planning process directed by the Hawaii Public Utility Commission.

The Cost of Energy

Geothermal generation on the Big Island

Geothermal energy has been an important source of electricity on the Big Island since the 30-megawatt (MW) Puna Geothermal Venture (PGV) plant began operation in 1993. PGV has been providing baseload power, generally between 25 and 30 MW—approximately 20% of the electricity delivered by HELCO.

Big Island residents have the highest use of their electricity in the evening, roughly between 6:00 and 9:00 p.m., when families are home at dinnertime. The peak demand on the Big Island is approximately 185 MW. During peak hours, as well as during the day when HELCO customers demand about 160 MW, HELCO usually purchases as much geothermal electricity as is available. Between midnight and dawn, however, electricity consumption is at its lowest, dropping to about 90 MW. During these hours, many Big Island power plants reduce their output, as there is no need for the electricity. The geothermal power plant is curtailed during these off-peak hours by several megawatts.

Geothermal power plants worldwide generally operate as baseload facilities; that is, producing a steady output 24 hours daily, seven days a week. Some facilities, such as PGV, do reduce output to "follow the load" during off-peak hours. However, geothermal wells are not turned on and off as power requirements change; steam is still produced, but if not used to generate electricity it bypasses the turbines and is simply injected back into the earth. Thus, there is some unused heat during the off-peak hours.

PGV's contract to provide electricity to HELCO was negotiated at a time when renewable electricity was tied to the price of oil. The current contract runs at least to December 31, 2027. It is not expected that future contracts for renewable electricity, including any for geothermal, would be tied to oil prices.

Potential benefits of increased geothermal power

Geothermal energy has a number of potential benefits for Big Island residents. Because it does not require imports of fossil fuel, it can contribute to more predictable and stable utility rates. This will be particularly important as oil becomes less available and more expensive.
The environmental impacts of producing, transporting, refining and using oil will also be reduced. The negative impacts of drilling for and shipping oil are currently "exported" to other countries, often affecting communities with environmental standards weaker than those of the US. Within Hawaii, we could expect to minimize oil spills and greenhouse gas emissions relating to burning fossil fuel.

Geothermal is a resource which is sustainable for centuries, given Hawaii County's geology. The heat resource is essentially inexhaustible. While individual wells or geothermal fields may change

over time, including changes in the proportion of liquid to vapor in the geothermal fluid, the presence of magma due to the "hot spot" beneath Hawaii ensures that heat will continue to be present in certain locations.

Also, although it is beyond the scope of the resolution, geothermal energy can provide more than just electricity. During off-peak hours, when Hawaii Island residents do not use as much electricity, geothermal heat could be used for a variety of other purposes, such as making liquid fuels, charging batteries, or supporting agricultural enterprises which require heat. These enterprises could contribute to Hawaii's clean energy future, and can also create jobs in addition to those needed to drill geothermal wells and operate the power plant.

State statute provides for the distribution of royalties paid by geothermal developers for the electricity they sell. Presently, 50% of the royalties are retained by the State of Hawaii Department of Land and Natural Resources, while 30% go to the County of Hawaii and 20% to the Office of Hawaiian Affairs. Additional electricity generation could provide more income to these agencies.

Pending additions to capacity

PGV and HELCO negotiated a contract for an additional 8 MW of capacity. If approved by the Public Utilities Commission, the contract would be highly unusual for a geothermal developer: it would allow for fully-dispatchable power. This means that HELCO operators would be able to control how much geothermal electricity is accepted on the grid, essentially allowing PGV's output to follow instantaneous changes in the load as well as providing peaking power. Additionally, the facility would add inertia to HELCO's system, which would help with grid stability. As is current practice, if steam from the geothermal wells is not needed for electricity, it will be injected into the reservoir. These additional 8 MW can be generated without additional production or injection wells being drilled.

In addition, PGV has obtained County and State permits to double its capacity to 60 MW, which would involve drilling additional wells. Though there is presently no demand for this amount of additional power on the Big Island, successful demonstration of fully dispatchable geothermal power could lead to more opportunities for expanded use of geothermal energy to meet existing demand.

The Big Island's geothermal resource

A number of assessments of the geothermal resource throughout the Hawaiian Islands have been conducted over the decades, with the most recent state-supported report produced in 2005. This report, "Assessment of Energy Reserves and Costs of Geothermal Resources in Hawaii," calculated the geothermal reserves for the state. Note that "reserves" is different from the total resource—estimates of reserves reflect the amount of recoverable heat energy anticipated to be present at drillable depths, while the total resource includes all underground heat and is a larger number.

Reserves were calculated for Big Island resource areas, including the Kilauea East Rift Zone (KERZ) as well as other rift zones. The combined minimum capacity for the Big Island is estimated to be 488 MW, but 1,396 MW is considered the most likely amount of reserves.

The calculation of reserves involves assumptions about the amount of heat which can be expected to be recovered at the surface and the efficiency of converting that heat to electricity. The calculation takes into account the reservoir area, its thickness, its average temperature, its average rock porosity, and other factors. It does not, however, imply that this energy can be exploited commercially.

It is highly likely that the commercially developable geothermal resource is smaller than the reserves. There is significant uncertainty regarding reservoir characteristics. In some areas, conditions may not support geothermal development; for instance, there may be heat but not sufficient fluid to transport the heat to the surface. In other areas, such as national parks, geothermal power plants cannot be developed.

The following table lists the estimated reserves for various Big Island rift zones, according to the 2005 assessment mentioned above. The smaller number is the calculated minimum capacity of the rift zone, with the larger number being the most likely capacity, reflecting the arithmetic mean. It should be noted that actual exploratory measures should be employed to confirm or modify these calculations. An updated assessment, including additional exploration, could provide more accurate numbers.

Puna Geothermal Venture has stated that they believe their leasehold in the lower KERZ is capable of producing 200 MW, which is consistent with the estimates given below.

Table 1.1 Estimated Geothermal Reserves, Island of Hawaii[1]

Rift Zone	Minimum capacity (MW)	Mean Capacity (MW)
Lower KERZ	181	438
Upper KERZ	110	339
Lower Kilauea SW Rift	64	193
Upper Kilauea SW Rift	68	201
Mauna Loa SW Rift	35	126
Mauna Loa NE Rift	22	75
Hualalai	7	25
TOTAL (rounded)	488	1396

[1] GeothermEx, Inc., 2005: *Assessment of Energy Reserves and Costs of Geothermal Resources in Hawaii.* Prepared for the State of Hawaii DBEDT.

The cost of geothermal electricity

Geothermal is a fully commercial renewable energy technology implemented in many countries around the world. The actual cost of geothermal electricity is currently significantly less than oil-generated electricity in Hawaii, in part due to the rising price of oil. For a 30-MW geothermal power plant in Hawaii designed to generate baseload power, the cost per kilowatt-hour is less than $0.10.

However, future costs will not necessarily be the same. For instance, should the additional 8 MW of load-following capacity come on line, the cost of generating a kilowatt-hour of electricity may be higher due to the ancillary services being provided.

The 2005 assessment provided an estimate of the levelized cost of power from a new 30-MW baseload geothermal power plant. The report made the following assumptions:

- Capital costs in the range of $2500-$5000/installed kW
- O&M costs in the range of $0.04-$0.06/kWh
- Initial drilling costs per well of $4 million to $9 million

With these assumptions, the mean levelized cost of power was calculated to be approximately $0.08 per kilowatt-hour.

Issues relating to expanding geothermal's baseload contribution

- PGV currently holds permits to double its output

Puna Geothermal Venture could double the capacity of its current power plant to 60 MW. However, currently there is no market for this amount of electricity on the Big Island.
Public hearings for the County of Hawaii's geothermal resource permit were completed years ago. At least some State of Hawaii permits are also in hand.

- How many, if any, additional permits are required?
- How many new production and injection wells will be needed?
- How many years would it take to develop another 30 MW of capacity?

- Other power plants currently provide baseload power

An existing independent power producer, Hamakua Energy Partners (HEP), has a 60 MW naphtha plant with a contract which runs from 2000 to 2030. HEP currently provides both capacity and electricity. It generates baseload power for HELCO, including during off-peak hours. Some HEP output is expected to be displaced by PGV's anticipated 8-MW addition as well as by the expected Hu Honua biomass-fired power plant in Pepeekeo, according to Jay Ignacio of HELCO (personal communication, Oct. 11, 2010.)

- Could additional geothermal capacity displace more generation from HEP?
- If so, what are the implications for the current contract with HEP?

- Existing fossil-fired utility power plants

Presently, HELCO distributes power from approximately 180 MW of generating capacity, including diesel and residual fuel oil plants around the island.

  - Which of these are scheduled for retirement?
  - How many years of economic life remain for each plant?
  - What is the financial impact of stranded investment on ratepayers and utility stockholders if any of the plants were decommissioned?
  - Could a new geothermal plant provide the stability and inertia presently provided by HELCO's fossil-fuel steam plants?

Challenges to increasing the proportion of electricity generated from geothermal energy

- "All eggs in one basket." There is strength and security in a diversified portfolio.
- Transmission issues. Presently, most of the electricity on the Big Island is generated on the east side, whereas the load is increasing on the west side. Electricity is lost during transmission, and transmission lines are subject to disruption.
- Mismatched demand. Demand (electricity use) is not well matched to geothermal's most cost-effective and technically mature application: 24/7 baseload production. Demand fluctuates throughout the day, whereas geothermal power plants are best suited to providing a steady output around the clock.
- Lack of market. Presently, HELCO does not need additional baseload power. HELCO does not anticipate needing more large power plants in the immediate future. If additional geothermal capacity were to be developed soon, it would require either displacing existing plants which have contracts for baseload electricity, or developing new markets—perhaps for non-electric uses of geothermal heat.

Possible actions to address these challenges

- Ensure that HELCO's portfolio remains diversified, ideally with a variety of renewable resources making significant contributions to the grid.
- Develop geothermal resources on the west side of the island to minimize transmission challenges and to generate electricity closer to where it will be used.
- Modify electrical demand to create markets for geothermal electricity during off-peak hours. This could include storing the energy in various forms, such as charging batteries, producing fuels such as hydrogen or ammonia, charging electric vehicles, or making ice for cooling applications during peak hours.
- Develop non-electric uses for off-peak geothermal energy, such as agricultural applications requiring heat—food or lumber drying, growing media pasteurization, biofuels production, and heating greenhouses. The County of Hawaii completed a feasibility study in 2007 which examined some of these applications[2].
- Explore the costs of contract buy-out and decommissioning existing power plants.

[2] Okahara & Associates, Inc., 2007. *Feasibility Study: Geothermal Direct Use, Kapoho/Pohoiki Area.* Prepared for the County of Hawaii Department of Research and Development.

Community Benefits

The PGV royalty is calculated according to the value of the resource using a formula developed by DNLR and the US Department of Interior; from that figure, 10 percent of the resource value is designated royalty. With regard to the royalties calculation and distribution, the Working Group recommends that Hawaii legislators revisit the way money is disbursed to the community. Moving forward, any expansion of geothermal would need to include a better package for fair compensation to the trust corpus of the ceded lands. The Hawaii State constitution clearly states "...proceeds and income derived on ceded lands (5f)..." are to be used to improve the conditions of the native Hawaiians as defined by the ACT. Hopefully, the mechanism can be developed by the legislature in concert with the local communities. Public hearings should be held to address all proposals being offered by all concerned.

The US Department of Energy is currently funding the development of several modifications to public transportation that will permit the transition from fossil fuels to hydrogen fuel for the Volcanoes National Park buses and the Hele-On trans-island bus service. Fuel-cell cars are being tested by the armed forces on Oahu and Big Island and will eventually support the establishment of refueling stations island-wide. The technology is available, but decades of subsidies, legislation favorable to the petroleum industry, and life-style choices by consumers has kept fossil fuel artificially profitable and has stymied the deployment of alternatives to gasoline-powered cars and buses. Transitioning to fuels that can be produced on Big Island and creating the attendant infrastructure of fueling stations and repair shops is strongly recommended.

Not only can geothermal power plants produce fuel for alternative-fuel power plants and vehicles, but also agricultural fertilizer that can replace products that are presently imported and expensive to farmers. Thus, the sale of fuel and fertilizer has the potential to become a major export business. Exporting hydrogen fuel in the form of ammonia from geothermal plants on Big Island to Oahu is one method of sharing the power resources with the population centers.

Insofar as as the usage of royalties from geothermal for community benefits has been masked by commingling the funds with other revenue streams provided to the Hawaii Department of Land and Natural Resources, the DLNR is requested to seek approval to direct monies received from geothermal funds to be used to explore and to identify promising geothermal sites and to further develop the resource. The change will permit an openness in accountability and allow the public to discern a prominent and unmistakable community benefit.

Additionally, a community advisory board should be established to offer suggestions to the DLNR about how royalties generated by geothermal power plants are spent in the future, especially after all the potential geothermal resource sites have been identified and tested.

Royalties Disbursement

Detailed Accounting of Geothermal Royalties

Geothermal royalties are based on power production and the sale of electricity to Hawaii Electric Light Company (HELCO). The geothermal royalties are paid directly to the Department of Land and Natural Resources (DLNR) by Puna Geothermal Venture (PGV) and DLNR allocates the royalties in three ways:

1. Department of Land and Natural Resources receives 50%
2. County of Hawaii receives 30%
3. Office of Hawaiian Affairs (OHA) receives 20%

DLNR submits an annual report to Hawaii legislators concerning geothermal royalties and the status of the inter-island power cable development. The figures below are taken from these reports. The amount of geothermal royalties paid to the State of Hawaii fluctuates each fiscal year, since power output and sales to HELCO vary.

Specific Distribution and Use of Royalties

The Department of Land and Natural Resources is responsible to effectively manage and develop geothermal resources, to protect the health and safety of the public, and to ensure the continued viability of the resource for the future. At present, the County of Hawaii benefits exclusively from geothermal power generation, which provides 20% of the electricity demanded island-wide.

The geothermal royalties are included as part of the $15.1 million transferred to the Office of Hawaiian Affairs each fiscal year. Based on its budget process, OHA allocates the $15.1 million, but not specific revenue sources, such as geothermal royalties.

OHA's budget is allocated based on approved work plans developed by staff. These work plans are derived from OHA's Strategic Plan, Strategic Priorities, and Strategic Results. The Strategic Plan for 2010-2016 focuses on the six Strategic Priorities:

1. Kahua Waiwai - Economic Self-Sufficiency
2. Aina - Land and Water
3. Moomeheu - Culture
4. Mauli Ola - Health
5. Ea - Governance
6. Hoonaauao - Education

The Board of Trustees (BOT) approves OHA's budget. The BOT has exclusive authority to decide how the "ceded lands revenue" is used to better the conditions of Hawaiians. Article XII, section 6 of the Hawaii State Constitution gives the Board the power to administer and manage "...all income and proceeds from that *pro rata* portion of the [SS 5(f)] trust referred to in section 4 of this article for native Hawaiians..." The Legislature's role is limited to quantifying Hawaiians' interest in the income and proceeds from the lands in SS 5(f) of the Admissions Act (refer to the Attorney General Opinion 03-04 regarding the Transfer of Ceded Land Receipts to OHA without Legislative Appropriation).

On June 27, 2006, OHA entered into an Agreement of Sale with The Trust for Public Lands (TPL) to purchase Wao Kele O Puna. The parties wish to preserve the property's natural and cultural resources and maintain traditional and customary practices through appropriate resource management. Funding in the amount of approximately $3.4 million was provided by the USDA Forest Service Forest Legacy Program and the balance was paid by OHA. No DLNR funds were used for the purchase.

Land Trust is a nonprofit organization as described in 501(c) of the Internal Revenue Code of 1986, that protects land by working with landowners who wish to donate or sell fee title or conservation easements to maintain conservation values associated with the land.

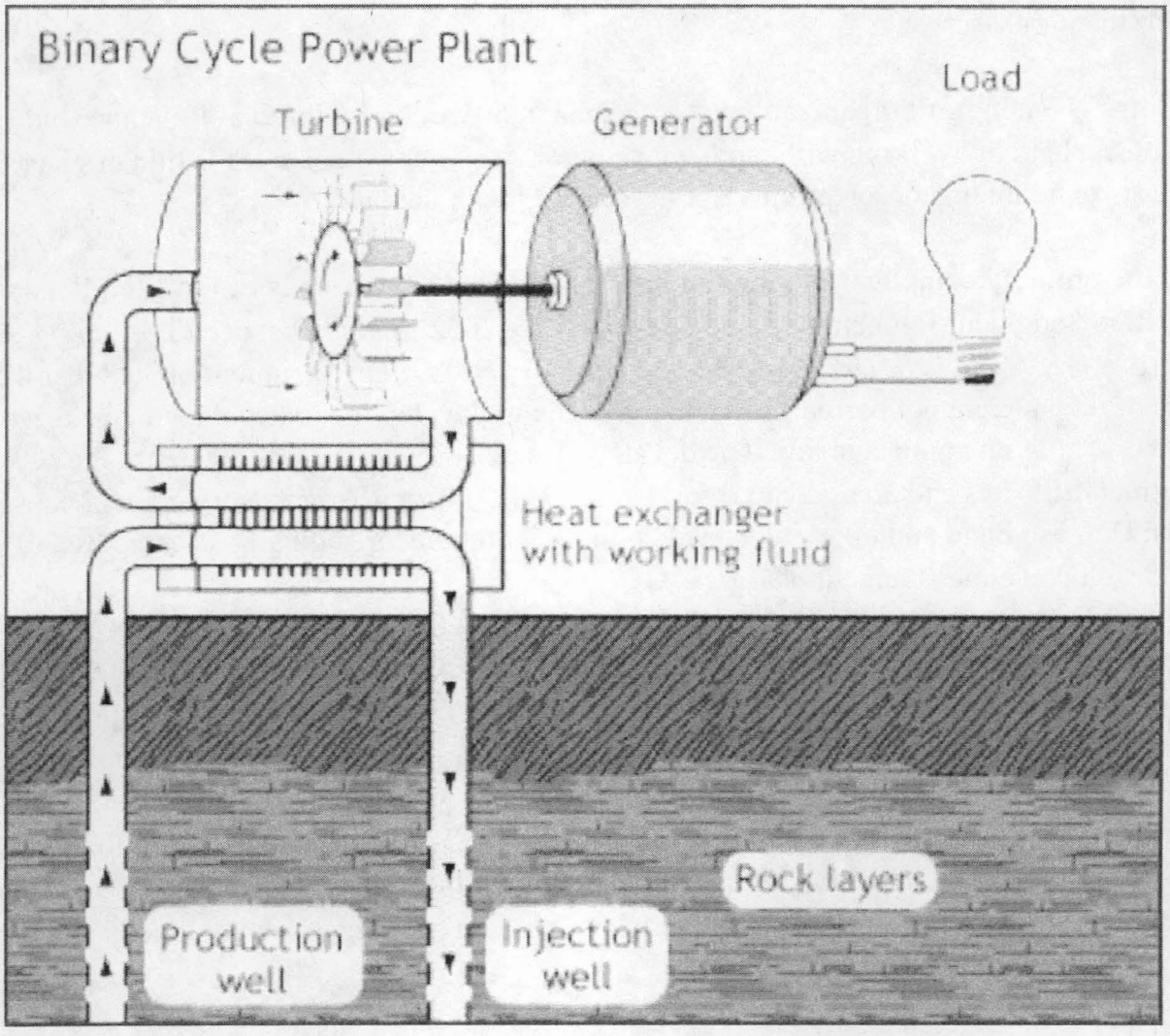
Use of the property complies with the Findings of Fact and Conclusions of Law and Final Declaratory Judgment/Injunction issued on August 26, 2002 in *Pele Defense Fund versus The Estate of James Campbell, Deceased, et. al*, Civil No. 89-089. The judgment opined that the owners of the land are not barred from and may seek to develop the undeveloped portions of the land consistent with applicable law. The developed areas as of January 1, 2001, are the access road, geothermal drill sites and areas cleared for geothermal drill sites. An advisory council consisting of the Pele Defense Fund and other interested community members, mutually selected by DLNR and OHA, developed a management plan.

The management plan included an inventory and assessment of natural and cultural resources, historical sites, risks, threats to resources, interpretive values, and economic development potential. The economic development-potential section identified uses consistent with the property's status as a forest reserve, the protection of traditional and customary uses of the site, sustainable use and protection of the resources of the site, and the terms of the Forest Legacy Program funding. The parties agreed to protect and enhance native plant and wildlife habitat, the natural, scenic and open-space nature of the property. The parties worked to plug an existing, but abandoned, geothermal well shaft on the property.

V. Geothermal Development in Hawaii

Geothermal can be a key component in a diversified energy portfolio for Hawaii County. Unlike solar and wind power, it is a "firm" resource—always there. Volcanic molten rock (magma) remains below Earth's crust, heating nearby rock, rainwater, and seawater that has seeped into the earth. Some of this hot water travels back up through faults and cracks and reaches Earth's surface as hot springs or geysers. Most of it stays deep underground, trapped in cracks and porous rock. This natural collection of hot water is called a geothermal reservoir.

Geothermal production wells bring the hot water to the surface and use its heat to vaporize a working fluid through a heat exchanger. The powerful expansion of the fluid from liquid to gas drives turbines that spin generators to produce electricity. Afterward, the hot water and gases are re-injected back into the injection zone below the water table. The working fluid is condensed and used again. This is a binary-cycle plant. The closed-loop circulation system means that no excess gases or fluids reach the open air.



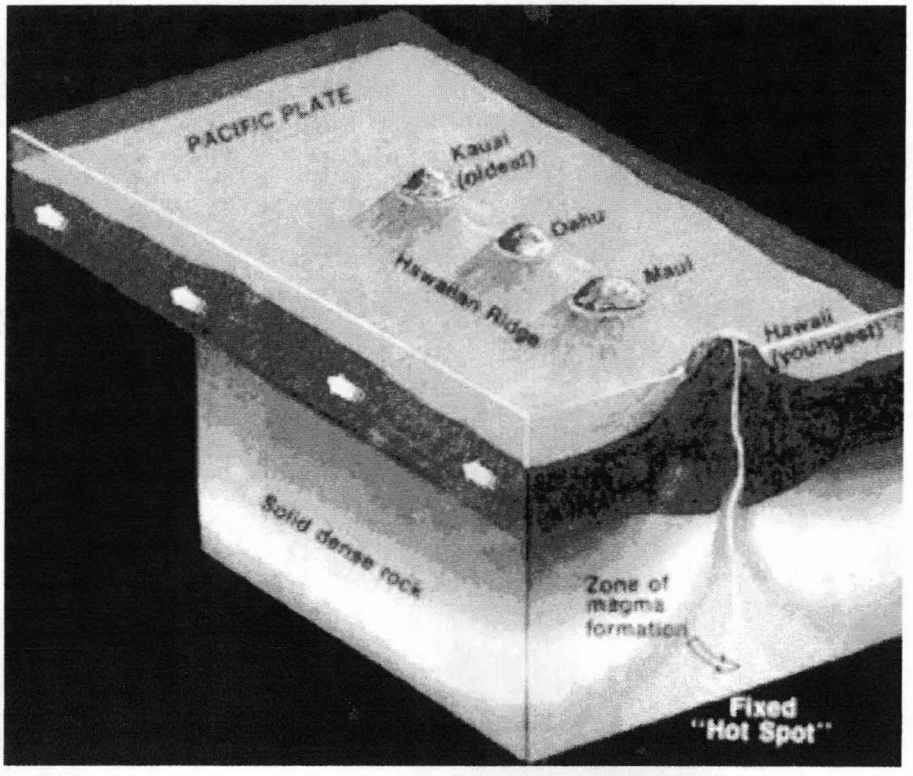
In 1993, the Puna Geothermal Venture Facility, located 21 miles south of Hilo on the Big Island, became the first commercial geothermal power plant in the state of Hawaii. Its binary-cycle plant produces about 30 megawatts of power, or 20 percent of the island's needs. That's enough electricity for 30,000 homes. PGV saves HELCO the equivalent of 144,000 barrels of petroleum a year. PGV is capable of expanding capacity and producing more power. Despite being restricted to the Big Island of Hawaii, geothermal produces thirty-one percent of Hawaii's renewable energy resources statewide.

The state has mandated that 20 percent of the electricity generated by public utilities comes from renewable sources by 2020. Yet, despite its efficiency, stability, and long-term viability, geothermal energy is not always the first consideration in the discussions of expanding energy resources. The public needs a greater awareness of geothermal energy to understand its potential.

Geothermal resources

Hawaii County lies above a geological *hot spot* in the earth's mantle that has been volcanically active for the past 70 million years. Big Island has had the most recent activity. Because of this, Hawaii County has immense potential for geothermal energy, both for electrical generation and fuel production. Geothermal power potential on the Big Island is estimated at between 500 and 700 Megawatts.

Geothermal interest has been motivated by the fact that imported oil is used to supply over 90 percent of Hawaii's energy needs; no other state in the U.S. is so critically dependent on imported oil. Geothermal is regarded as a renewable source and can help to make the island less dependent on imported energy.



VI. References to Subject-Matter Experts

Iceland report http://english.aljazeera.net/video/europe/2011/04/20114221651586099 2.html

While the vast majority of investment in the energy transition will come from the private sector, government has an important role in creating policies and incentives that encourage investment conditions.

Globally, geothermal exploration and drilling has, on average, a 50% or less success rate; it is very difficult to find commercial financing because of this risk. Hawaii has some major advantages, though: Hawaii has identified geothermal resource sites, state agencies are familiar with geothermal, there are local engineers with expertise, there are local educators with expertise, a local workforce is available, and the transmission lines are not far from the most promising resource sites. These factors make Hawaii a desirable location in the eyes of lenders, investors, and the renewable energy industry. Government can tip the balance in Hawaii's favor by offering appropriate incentives.

See ***Appendix O*** Barriers to Geothermal Development

The end of cheap oil is upon us. Given that Hawaii uses oil for 90% of its power, this is an urgent concern. Worse, the price of a barrel today is a false indicator of true reserves and future market costs; current conditions provide an unreliable basis for projections and planning. The uncertainty for businesses and government adversely affects all Hawaii residents.

See ***Appendix J*** Strategic Risks and Opportunities for Business

The use of petroleum in the world is now up to about 30 billion barrels per year. The rate at which we have found new supplies of petroleum over the last 10 years has fallen to an average of only about 10 billion barrels per year. We're obviously in an unsustainable situation. We are now using up a greater number of barrels that we have found in the recent past and that we have reserved in the ground. We are now beginning to use it up relatively quickly--with scary consequences for the future.

See ***Appendix H*** Charles Maxwell interviewed by Wallace Forbes

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference.

See ***Appendix I*** Association for the Study of Peak Oil & Gas Conference

The depletion of fossil fuels has been occurring since the first ton of coal or barrel of oil was mined. Since these fuels need about 100 million years to regenerate, depletion and technology are in a race. Furthermore, there is considerable evidence that we are mostly just pumping out old fields rather than replacing extracted oil with newly found oil. If current trends continue linearly, then in about two to three decades it will take one barrel of petroleum to find and produce one barrel of petroleum. Oil will cease to be a net source of energy.

The implications of this are obvious, huge, and make an argument for seeking substitutes earlier rather than later.

See ***Appendix G*** Energy Return On Investment by Dr. Charles A. S. Hall

The world is overwhelmingly dependent upon depleting supplies of fossil fuels. There is consensus among credible resource scientists and many economists that petroleum prices will rise to unprecedented levels in a few years. The cost? Volatile oil prices lead to the world-wide market collapse of 2008.

See ***Appendix J*** Strategic Risks and Opportunities for Business

One important goal of the Geothermal Working Group is to assess the minimum return-on-investment that must be attained from Hawaii's energy resources in order to support optimum social and economic activities. Hawaii suffers from an unfavorable return-on-investment for fossil fuel; the cost to drill, refine and deliver petroleum is three times greater than petroleum's benefit for use in utilities, farming, transportation, etc. The conclusion: using fossil fuel to power Hawaii is not sustainable.

See ***Appendix G*** Energy Return On Investment by Dr. Charles A. S. Hall

Government regulations can encourage investments in new energy

Source: http://oilprice.com/Alternative-Energy/Renewable-Energy/The-Need-for-a-Real-Domestic-Alternative-Energy-Policy-in-the-USA.html

Alternative energy (or renewable energy) is a new manufacturing industry paradigm that is in its infancy. However, the discussion is not new, and it looks as if the United States has positioned itself to be *behind history*.

After the oil shortages in the 70's, government officials began discussing energy policy as a matter of national security, but this misses the point of a globally competitive economic world. What is needed now (and what will aid in rebuilding the economy), is a change in paradigm so that America will remain competitive in a rapidly changing economic climate.

In order for new industries to start up, protections against losses have to be guaranteed by the government so industry will take the risk of investing. Governments have the ability to hold and maintain debt even above yearly revenue in order to stimulate economic activity. The government has a duty to utilize tax revenue in order to secure American economic competitiveness.

Alternative energy: A boom industry that needs government stimulus

China now leads the world in installation of wind turbines and solar thermal systems. With a $211 billion investment in 2010 for renewable energy, it is on the rise and should not be discounted to have conversations about drilling in the Gulf of Mexico or whether or not the EPA should remain.

The overemphasis on tax cuts as the only way to spurn private business has become a mantra that is corrosive and harming American capabilities to deal properly with the economic crisis and get people back to work. Alternative energy is a boom industry that needs government stimulus in order to cover the initial losses that would be incurred by private industry.

Source: http://oilprice.com/Alternative-Energy/Renewable-Energy/The-Need-for-a-Real-Domestic-Alternative-Energy-Policy-in-the-USA.html

Analysis by Robert Rapier, author and energy consultant

Normally, consumers consider falling oil and gasoline prices to be good news. They have to pay less to fill up their tanks. And if the reason for that is that oil supplies are increasing at a rate faster than demand is increasing, it can indeed be a good situation for consumers, and good for the economy.

But here's the bad news: that is not the case today.

Oil prices fell to below $90 a barrel, their lowest level in six months. I think oil prices are likely to fall further in the short term, and gasoline prices won't be far behind. While this news alone does mean that consumers will get some relief, the broader picture is grim. The reason oil prices fell by so much is not because a lot of new production came online, but rather because the economy is very sick, and a lot of people are out of work. Economic activity continues to be weak, and that means demand for oil is expected to be weak. In short, not as many people can afford oil and the things made from oil.

However, oil is a global commodity, and some economies continue to boom. Therefore, I don't expect prices to go down and stay down. Growth in just China and India will see to that. The Long Recession hypothesis says that when there isn't much spare oil production capacity, growth in developing countries will tend to keep oil prices high. But high oil prices are a drain on economies that are highly dependent upon oil (like the United States). Thus, if oil dependent countries are in recession during a time that oil production capacity isn't growing (or worse, shrinking), they are going to have a pretty tough time coming out of that recession.

Or a simpler way to put it is this. It may be that the U.S. economy and America's per capita oil consumption of 23 barrels of oil per person per year can't grow in the face of $100 oil. But if countries like China and their 2 barrels of oil per person per year continue to grow while buying $100 oil, then we have truly entered a new paradigm. What may happen is that both China and the U.S. end up consuming 5 or 8 barrels per person per year, which could still grow China's economy, while the U.S. gets there by shrinking ours. China's growth is probably the most worrisome factor because we will be competing against them for global oil supplies.

Source: http://www.consumerenergyreport.com/blogs/rsquared/

GE Poll Source: http://www.genewscenter.com

Nearly eight in 10 US consumers — 79 per cent — say in a new survey that they're ready to make short-term changes in their energy use habits to gain longer-term benefits.

Commissioned by GE, the national survey found that 72 per cent believe that, left unchanged, today's energy sources and consumption habits could hurt the country's economic growth. And 63 per cent said they're willing to work with their power companies to help bring about changes in consumption patterns.

According to GE, the survey findings indicate that people in the US are ready to see changes in the nation's energy landscape.

"There are some things that are essential to achieving a desired quality of life, and Americans overwhelmingly agree that investing in our nation's energy future is one of them," said Bob Gilligan, vice president of digital energy for GE Energy Services. "The American electrical grid system has undergone little investment in the past 25 years. Even worse, most generation stations were built in the 1960s or earlier using even older technology. As a nation, Americans recognize that a cleaner, smarter and more efficient energy infrastructure will help create a competitive economic future. The key is to invest correctly — the right way rather than the easy way."

Association for the Study of Peak Oil & Gas Conference
Washington, DC (Platts News Service) - Leslie Moore Mira

"The global rate of production of oil is peaking now," said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin.

Frank Rusco, an energy director at the US Government Accountability Office, said, "The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper."

See ***Appendix I*** Association for the Study of Peak Oil & Gas Conference

Lloyd's of London White Paper

1. Energy security and environmental concerns will fundamentally alter the way that we manage and use energy.

2. Modern society has been built on the back of access to relatively cheap, combustible, carbon-based energy sources. That model is outdated.

3. China and emerging Asian economies demonstrated their buying power in the energy markets.

4. Energy markets will continue to be volatile as traditional mechanisms for balancing *supply and price* lose their power.

5. Much of the world's energy infrastructure lies in areas that will be increasingly subject to severe weather.

6. Without an international agreement on climate change mitigation, energy transitions will take place at different rates in different regions.

7. The introduction of *carbon pricing* and *cap and trade* schemes will make the unit costs of energy more expensive. The most cost-effective mitigation strategy is to reduce fossil fuel energy consumption.

8. Businesses must address the impact of energy and carbon constraints holistically, and throughout their supply chains. Tight profit margins on food products, for example, will make some current sources unprofitable as the price of fuel rises and local suppliers become more competitive.

9. The last few years have witnessed unprecedented investment in renewable energy and many countries are planning or piloting 'smart grids'. This revolution presents huge opportunities.

See ***Appendix J*** Strategic Risks and Opportunities for Business

The members of the Geothermal Working Group wish to acknowledge the administrative efforts of Christopher Westlye, who edited and arranged the Geothermal Working Group report.

Appendix A

Senate Concurrent Resolution 99
Senator Russell Kokubun

THE SENATE.
TWENTY-FIFTH LEGISLATURE, 2010.
STATE OF HAWAII.

S.C.R. Number 99. FEBRUARY 26, 2010.

SENATE CONCURRENT RESOLUTION.

REQUESTING THE ESTABLISHMENT OF A WORKING GROUP TO ANALYZE THE POTENTIAL DEVELOPMENT OF GEOTHERMAL ENERGY AS THE PRIMARY ENERGY SOURCE TO MEET THE BASE-LOAD DEMAND FOR ELECTRICITY ON THE BIG ISLAND.

WHEREAS, in 1881, King David Kalakaua visited Thomas Edison in New York to discuss extracting power from Hawaii's volcanoes and using underwater cables to carry power between islands; and

WHEREAS, at the time, his strategy did not prove to be feasible, and hydropower was used to generate electricity to light Honolulu; and

WHEREAS, today, technology advances make geothermal energy not only feasible, but a top source of renewable energy; and

WHEREAS, geothermal energy is a more reliable source of energy than solar or wind energy, because when the wind does not blow and the sun does not shine, the heat from the volcano continues to produce a steady flow of power; and

WHEREAS, Hawaii's ratio of renewable energy generation (ten percent) to fossil fuel generation (ninety per cent) ranks third in the nation; and

WHEREAS, the United States Department of Energy has indicated that Hawaii is one of the best positioned states for renewable energy potential; and WHEREAS, the United States Environmental Protection Agency asserts that greenhouse gases threaten public health and

science overwhelmingly shows greenhouse gas concentrations are at unprecedented levels due to human activity; and

WHEREAS, there is irrefutable evidence that global warming is real and occurring at an alarming rate, with rising sea levels and stronger and more frequent storms; and

WHEREAS, the designation and establishment of geothermal resource sub-zones more than twenty-five years ago needs to be reviewed to reaffirm or amend the original feasibility assessments; and

WHEREAS, previous geothermal development has raised sensitive issues regarding the impacts on native Hawaiian cultural and spiritual practices; and

WHEREAS, Hawaii needs a sustainable energy market that strikes a balance between economic, community, and environmental priorities; and

WHEREAS, the Hawaii Clean Energy Initiative aims to meet seventy per cent of the State's energy needs through renewable sources by 2030; and

WHEREAS, geothermal energy is efficient and stable, and has long-term viability to help Hawaii meet its 2030 goals, reduce its contribution to global warming, and create a sustainable energy market; and

WHEREAS, as a proven source of reliable firm capacity, geothermal energy has great potential to be the primary source of energy to meet the Big Island's base-load demand, generating the amount of power required to meet minimum electricity demands based on reasonable expectations of customer requirements; now, therefore,

BE IT RESOLVED by the Senate of the Twenty-fifth Legislature of the State of Hawaii, Regular Session of 2010, the House of Representatives concurring, that the County of Hawaii is requested to establish, convene, and facilitate a working group to analyze the potential development of geothermal energy as the primary energy source to meet the baseload demand for electricity on the Big Island; and

BE IT FURTHER RESOLVED that the working group consist of eleven members with the Mayor of Hawaii County designating the chairperson, including:

1. The Hawaii County Energy Coordinator, or designee;
2. One member designated by Hawaii Electric Light Company;
3. One member designated by the Big Island Labor Alliance;
4. One member designated by the Hawaii Island Economic Development Board, Inc.;
5. One member designated by the Chairperson of the Public Utilities Commission;
6. The Hawaii Island Office of Hawaiian Affairs Trustee, or designee;
7. One member designated by the Director of Business, Economic Development, and Tourism;
8. One member designated by the Chairperson of the Board of Land and Natural Resources;
9. One member who is a representative of a non-profit, environmental group to be selected by the President of the Senate;
10. One member who is a representative of a cultural organization to be selected by the Speaker of the House of Representatives; and
11. One member representing West Hawaii to be selected by the Mayor of Hawaii County; and

BE IT FURTHER RESOLVED that the working group consider the potential impacts of expanding geothermal energy production on native habitats, pristine forest environments, and native Hawaiian values and practices, and recommend mitigative measures to ameliorate any adverse impacts that may be caused by geothermal energy production expansion; and

BE IT FURTHER RESOLVED that the working group also consider what improvements may be required for the electricity transmission system and what funding may be available for such projects from the United States Department of Energy; and

BE IT FURTHER RESOLVED that the working group is requested to include a feasibility and cost-benefit analysis of using geothermal energy as the primary energy source to meet base-load demand on the Big Island, including an analysis of community, environmental, and economic benefits; and

BE IT FURTHER RESOLVED that any community benefits analysis include the possibility and feasibility of establishing a community benefits package that includes the distribution of royalties derived from geothermal energy production to impacted communities, and strategies to avoid passing costs onto the customer; and

BE IT FURTHER RESOLVED that the working group is further requested to include a detailed accounting of the geothermal royalties collected by the State, the County of Hawaii, and the Office of Hawaiian Affairs, including how those entities distribute and use the royalties; and

BE IT FURTHER RESOLVED that the County of Hawaii is requested to provide an interim report to the Legislature no later than twenty days prior to the convening of the 2011 Regular Session, and the final report of the working group to the Legislature no later than twenty days prior to the convening of the 2012 Regular Session; and

BE IT FURTHER RESOLVED that certified copies of this Concurrent Resolution be transmitted to the Governor, the Chairperson of the Board of Land and Natural Resources, the Director of the Department of Business, Economic Development, and Tourism, the Chairperson of the Office of Hawaiian Affairs, the Mayor of Hawaii County, the Chairperson of the Hawaii Island Economic Development Board, Inc., the Chairperson of the Public Utilities Commission, the President of the Hawaii Electric Light Company, and the President of the Big Island Labor Alliance.

Appendix B

Composition of the Working Group

The working group consists of eleven members with the Mayor of Hawaii County designating the chairperson, including:

1. The Hawaii County Energy Coordinator, or designee

Member: Richard Ha, President of Hamakua Springs Country Farms, co-chair of Working Group

2. One member designated by Hawaii Electric Light Company

Member: Jay Ignacio, President of HELCO

3. One member designated by the Big Island Labor Alliance

Member: Wallace Ishibashi, Jr., Big Island Labor Alliance, co-chair of Working Group

4. One member designated by the Hawaii Island Economic Development Board, Inc.

Member: Barry Mizuno, HIEDB

5. One member designated by the Chairperson of the Public Utilities Commission

Member: David Mattice, Hawaii County PUC representative

6. The Hawaii Island Office of Hawaiian Affairs Trustee, or designee

Member: Robert Lindsey, Hawaii Island OHA trustee

7. One member designated by the Director of Business, Economic Development, and Tourism

Member: Andrea T. Gill, Renewable Energy Specialist, State of Hawaii

8. One member designated by the Chairperson of the Board of Land and Natural Resources

Member: DLNR- Did not send a representative

9. One member who is a representative of a non-profit, environmental group to be selected by the President of the Senate

Member: Nelson Ho, Chair of the Moku Loa Group (Hawaii Island), Sierra Club

10. One member who is a representative of a cultural organization to be selected by the Speaker of the House of Representatives

Member: Patrick Kahawaiola'a, President of the Keaukaha Community Association

11. One member representing West Hawaii to be selected by the Mayor of Hawaii County

Member: Jacqui Hoover, executive Director HLPC-West Side Representative

NEIL ABERCROMBIE
GOVERNOR

HERMINA MORITA
CHAIR

JOHN E. COLE
COMMISSIONER

MICHAEL E. CHAMPLEY
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October 12, 2011

Mr. Richard Ha, Co-Chair
Mr. Wallace Ishibashi, Co-Chair
Geothermal Energy Working Group

Dear Chairs Ha and Ishibashi and Members of the Geothermal Working Group:

As the Chair of the Hawaii Public Utilities Commission ("PUC"), I request that clarification of the PUC's participation in the development of the final report of the Geothermal Energy Working Group ("working group") be added to the appendix of the final report.

Senate Concurrent Resolution No. 99, Session Laws of Hawaii 2010, names one member designated by the Chairperson of the PUC. It is my understanding that Commissioner Carlito Caliboso attended the meetings with the intent of acting as a resource to the working group. Upon my becoming Chair in mid-March 2011, I designated the PUC Hawaii Island Representative, David Mattice, to attend on behalf of the Chair to mainly observe rather than actively participate in the meetings.

I truly appreciate the dedication and efforts of the working group, however, given: (1) the PUC's role as the regulatory agency presiding over any resulting power purchase agreement for geothermal energy, and (2) the likelihood that other geothermal issues will be adjudicated by the PUC in the future, I did not feel it would be appropriate for the PUC to comment on the specific findings and recommendations of the working group. Therefore, clarification within the final report is requested to ensure that listing the PUC as a working group member will not be misconstrued as the PUC taking an active role in the development and adoption of the specific findings and recommendations of the working group prior to the PUC presiding over any resulting project power purchase agreement.

Thank you for your consideration in this matter.

Sincerely,

Hermina Morita
Chair

HM:CPA:ac

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William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

County of Hawai'i
Office of the Mayor

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Geothermal Energy Working Group
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

Wednesday, June 2, 2010
Office of the Mayor

CALL TO ORDER

The inaugural meeting was called to order by Co-Chairman Richard Ha at 3:10 p.m. Co-Chairman Ha introduced Mayor Billy Kenoi.

PRESENT:

Carlito Caliboso
Richard Ha, Co-Chairman
Nelson Ho
Jacqui Hoover
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Ted Peck

GUEST SPEAKERS
Jose Dizon, HELCO
Mike Kaleikini, Puna Geothermal Venture
Mayor Billy Kenoi
Council Member Emily Naeole-Beason

Mayor Kenoi thanked everyone for their support of the newly formed Geothermal Energy Working Group. He acknowledged the presence of Councilwoman Emily Naeole-Beason.

Mayor Kenoi stated that everyone recognizes that energy and its cost moving forward determine the quality of life for island residents. It is essential to address the importance of renewable and alternative energy development. He explained that the Hawai'i Clean Energy Initiative aims to have the State obtain 70 percent of its energy from renewable energy sources by 2030. If there is any community that will achieve that goal, it is the County of Hawai'i, because it is already at 32 percent.

Mayor Kenoi stated that in order to accomplish this goal it is necessary to maximize the availability and the opportunity that surrounds geothermal. Senate Concurrent Resolution 99 (SCR 99) directs Hawai'i County to establish a working group to analyze the potential development of geothermal energy making it cost effective and feasible. The Geothermal Working Group will consider the expansion of geothermal development and address its impact on the environment and its culture.

Mayor Kenoi stated that he feels confident that the members selected consist of talented individuals who will make significant and substantial strives in expanding and utilizing the "gift of geothermal."

Councilwoman Naeole-Beason offered a short prayer to spiritually guide the members in wisdom, knowledge, and understanding.

Councilwoman Naeole-Beason commented that she witnessed the process of geothermal and how it has evolved throughout the years. She supports the newly formed group and looks forward to the county providing new sites for geothermal. As a result of Puna geothermal, she is presently the only councilmember on Hawai'i Island who is capable of utilizing royalty funds to take care of her district. She hopes that in the future other Council districts will be able to benefit from geothermal.

Co-Chair Ha thanked everyone for supporting the newly formed Geothermal Energy Working Group. He explained that this working group will need to file an interim report with the Legislature prior to the start of its 2011 session. In the next seven months, the group is directed by SCR 99 to analyze the potential development of geothermal energy as the primary energy source that can meet the base load demand for electricity on the Big Island.

As a farmer, Co-Chair Ha stated that in the past he attended several seminars. He learned about the concept of energy return on investment, and the standards of rural oil supplies. Studies indicate that the end of cheap oil is near. Individuals who are less fortunate financially will be the most vulnerable. Co-Chair Ha explained that according to HELCO's website, geothermal energy costs approximately 11 cents per kilowatt hour for base power. Based on this figure, it is by far the cheapest form of base power. Geothermal is proven technology: it's cheap, it's a gift to use wisely, and it can be shared with future generations. Also, there are future possibilities to develop with geothermal including transportation, fertilizer, ammonia, etc.

Representing the Big Island Labor Alliance, Co-Chairman Wallace Ishibashi explained that in the 1980's he was a member of the first geothermal group called the Hawai'i Island Geothermal Alliance (HIGA). At that time, it was a touchy subject, however; over the course of time the first phase of geothermal has proven to be very effective, clean, and beneficial to Hawai'i island. Mr. Ishibashi said that he continues to take interest in the development of geothermal because "it is the right thing to do Geothermal energy is available in only certain regions of the world and Hawai'i Island is blessed to have this resource."

Co-Chair Ishibashi stated that the Hawaiian community may possibly have concerns regarding this issue. It is the Geothermal Energy Working Group's responsibility to address them openly with understanding and aloha. He said, "the fact is Pele is recognized as a living goddess to some Hawaiians in the community. It is important to acknowledge the communities issues with respect and understanding of their culture."

In order for geothermal to succeed, Co-Chair Ishibashi commented that the key is for businesses and the working class to see a difference in their electric bill. Once businesses receive savings, they can than afford to provide better wages to their workers. He also commented that many people believe that there is a price to pay in order to live in Hawai'i. Co-Chair Ishibashi stated that that way of thinking must change. The fact is that cheaper energy attracts better business opportunities for our islands. Geothermal will reduce the cost to Hawai'i residents and business operators. Therefore, the goal is to attract better business in Hawai'i because this cheap base energy will allow affordable living.

Co-Chair Ha asked that all members introduce themselves.

Patrick Kahawaiolaa introduced himself as the current president of the Native Hawaiian Community on Hawaiian Homelands. As a representative of the native Hawaiian community he would like to move forward with geothermal becoming a meaningful resource.

Nelson Ho introduced himself and stated that he got involved with geothermal energy in 1981. That is when 500 megawatts was proposed adjacent and upwind of Hawai'i Volcanoes National Park. He is interested in learning what new developments have transpired. In the past, some of the original concerns raised involved the demand. Those issues involved the cost of bringing in a new supply of energy, the efficiency and usage, and whether the environmental and cultural subsidies were sufficient in making geothermal economical as an energy resource.

Mr. Ho explained that there were a lot of constraints on geothermal energy. Those constraints are on the record and are historical. He would like to see if any of these issues have changed throughout the years. Also, he would like to know what the Public Utilities Commission's views are regarding this resource becoming the base load energy.

Jacqui Hoover introduced herself as a representative of West Hawai'i, she is involved with the Hawai'i Leeward Planning Conference and the Hawai'i Economic Development Board. She was born and raised on Hawai'i Island. Thereafter, she attended school in California. Ms. Hoover mentioned that she was involved with the early geothermal efforts in California and would like to see what opportunities exist in order to stabilize energy use on Hawai'i Island.

Carl Caliboso introduced himself as chairman of the Public Utilities Commission. He explained that the PUC's role is to regulate public utilities. In this case, this regulation will be directed towards HELCO. He personally encourages HELCO to consider and explore existing alternative energy sources like geothermal. The consideration of expanding geothermal is very interesting. The PUC has an interest in making sure that utility service provided to the community is reliable and offers reasonable rates to the consumer. Sometimes it is necessary to make an investment in a short term to have long term benefits. This is seen a lot with other renewable energy type options and investments that are being considered and proposed. Mr. Caliboso remarked that it is also important to be sensitive to many different concerns that are deeply rooted because that is why this taskforce was established.

Jose Dizon introduced himself as the general manager for operations at HELCO. He participated at the First Natures' Futures program symposium on Friday. At that symposium, he spoke about the challenges in Hawai'i involving social, cultural, and historical issues. Although there are many issues involved, Mr. Dizon stated that he does believe there is a way to make it work.

Barry Mizuno introduced himself as a representative of the Hawai'i Economic Development Board. He disclosed that he worked for Puna Geothermal Venture and retired in 2006. At the present time, he works as a consultant for them. He stated that there are many experts that have indicated that there will be a $200 barrel of oil increase within the next 18 months. "This is scary, whether it is true or not." Hawai'i is 90 percent reliable on fossil fuel, and it is important to seriously consider other options immediately to plan for the future.

Ted Peck introduced himself as the energy administrator for the Hawai'i State Energy Office. He was also on the panel on Friday. He stated that his heart was wounded when he heard the stories of when geothermal was first introduced, and the insensitive and inappropriate way that it was put forth. As a State and as a Nation there have been many wrong doings. However, we are now on the door step of a different kind of oppression and we have an opportunity to free ourselves from that oppression. Geothermal energy working for the community, the county, and culture can have a role with future possibilities such as transportation. Mr. Peck stated that he is honored to be a part of this taskforce and looks forward to exploring this matter further.

Co-Chair Ha stated that Hawai'i can become comparatively advantageous to the rest of the world. Geothermal will elevate our economy and community to a higher place.

HELCO Presentation – Big Island Energy Overview
Presentation provided by HELCO General Manager Jose Dizon
(See Attachment A)

PGV Presentation – Geothermal Energy in Hawai'i
Presentation provided by PGV General Manager Mike Kaleikini
(See Attachment B)

Co-Chair Ha requested that someone volunteer to collect data for the cost benefit analysis report.

Mr. Mizuno stated that the report provided to the group on Assessment of Energy Reserves and Costs of Geothermal Resources in Hawai'i was created by the State of Hawai'i Department of Business, Economic Development and Tourism (DBEDT) on September 30, 2005. He asked that the members review the executive summary identifying the five geothermal rift zones on the Big Island. All five of the combined resource areas have a minimum megawatt of 488 and a combined megawatt of approximately 1396. Since the report is dated from 2005, Mr. Mizuno commented that it is necessary to receive a current projection.

Mr. Peck advised that action will be taken to discuss that matter with DLNR.

Ms. Hoover informed the group that although the report is dated in 2005, the data was collected in 2000.

Mr. Peck's assistant interjected and stated that there is no current study.

Mr. Ho recommended that a representative from DLNR attend future meetings because they designate where geothermal occurs.

Mr. Peck volunteered to meet with DLNR and provide a report at the next meeting.

ASSIGNMENT OF COMMITTEES

- Committee on Feasibility and Cost-Benefit Analysis
  - Ted Peck and Jacqui Hoover will provide a report.

- Committee on Potential Impacts of Geothermal Energy Production Expansion
  - Nelson Ho and Patrick Kahawaiolaa will provide a report.

- Committee on Electricity Transmission System Improvements and Funding.
  - Jose Dizon will provide a report.

- Committee on government accounting and community benefits packages of royalty distributions.
  - Barry Mizuno will provide a report.

FUTURE MEETINGS

The members agreed on the following:

- Tour of HELCO and PGV facilities.
- Meetings will be arranged monthly with the help of the County.
- Meetings will be open to the public.
- Meetings will be two hours.

UPCOMING AGENDA ITEMS

- Geothermal future possibilities regarding hydrogen and ammonia.

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Transcriber

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

Thursday, July 15, 2010
Hamakua Conference Room

CALL TO ORDER

The meeting was called to order by Co-Chairman's Richard Ha and Wallace Ishibashi at 2:10 p.m. Appreciation was offered to Jay Ignacio and Jose Dizon for allowing the Geothermal Energy Working Group to tour the HELCO plant prior to the meeting.

PRESENT:

Carlito Caliboso
Andrea Gill
Richard Ha, Co-Chairman
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Robert Lindsey

GUEST SPEAKERS:

Donald Thomas, Center for the Study of Active Volcanoes
Kanoe Wilson, First Nations' Futures Program

A question was raised regarding the recent power outage on the Big Island.

Jay Ignacio explained that there was a series of generators that tripped off-line. There was approximately a 50 percent power loss on the island which resulted in a large imbalance of power. When this type of incident occurs, an Automatic under Frequency Load Shed system automatically disconnects customers in order to correct the

imbalance. This systems capability allows HELCO to control the system remotely, reestablishes the imbalance in power, and quickly restores service to customers.

GUEST SPEAKERS

Hawai'i's Geothermal Resources an Overview and History Powerpoint Presentation provided by Donald Thomas. (See Attachment "A")

Mr. Thomas explained how the island chain was formed and how all islands were derived from a planetary process called a "mantle plume." This process has been generating magma for the past 80 million years. This ultimate heat source floors Hawai'i's volcanism and it has been a long standing process. Presently, the Big Island happens to be located over the mantle plume. Kilauea volcano is over the "hotspot" and is recognized as one of the highest areas for geothermal potential. He pointed out that Kilauea actually has two rift zones the east rift zone and the southwest rift zone. The enormous size of the east rift zone compared to the southwest rift zone is clear evidence that much more lava has erupted from the east rift zone.

Mr. Thomas identified Hawai'i island's volcanoes and provided the members with a brief history on their location, age, activity, and subzone locations for potential geothermal energy.

Mr. Thomas mentioned that a Geothermal Technical Advisory Committee was formed in the past. Those members collected data in order to identify geological sites for geothermal. The committee became inactive and stopped meeting.
At this time, there is consideration to reactivate the committee so that they can gather additional information and re-evaluate the original data. In his opinion, Mr. Thomas stated that although work conducted in the 70's and 80's were sufficient, it is necessary to obtain a geophysical survey at this time.

If an update is conducted every five years, Co-Chairman Ishibashi inquired on when was the most recent.

Mr. Thomas answered that the last update was in 2005.

Ms. Andrea Gill commented that geophysical surveys were not done at that time.

Co-Chairman Ishibashi inquired on whether the committee was reactivated.

Mr. Thomas replied that an informal proposal was sent to DLNR and he anticipates meeting with them to discuss if they are interested in reactivating the committee.

Co-Chairman Ha inquired on what kind of equipment is available now that was not available in the past.

Mr. Thomas stated that there is a technique called a magneto telluric survey. It involves an instrument that looks at natural occurring electrical signals underground.

As a potential subzone for geothermal, Mr. Kahawaiolaa asked for an estimate on how long the east rift zone's heat would remain hot.

Mr. Thomas stated that it's certain that the Big Island will eventually move off of the hot spot. However, the rate of movement is extremely slow. His estimate is that Kilauea's east rift zone will remain active for at least another half a million years, and even after that, residual heat could continue.

First Nations' Futures Program Powerpoint Presentation provided by Kanoe Wilson. (See Attachment "B, C, D")

Ms. Kanoe Wilson explained that her presentation will touch upon the cultural perspectives on geothermal energy on Hawai'i Island. She briefed the members on the First Nations' Futures Program. The First Nations' Futures Program is an international alliance between Kamehameha Schools, Stanford University, and Maori from Aotearoa (New Zealand).

Ms. Wilson stated that FNFP is a leadership-development program which is involved with various community issues. This year they are tasked with investigating geothermal energy. The key note will be to look at various perspectives out in the community and to find a way to educate and promote the broader understanding of geothermal energy on Hawai'i Island.

According to Ms. Wilson, Kamehameha Schools has identified property on the west side of the island that has a potential geothermal resource.

Ms. Wilson said that her group generated a research question that would identify goals for the project. The purpose was to identify and analyze cultural, environmental, social, economical, educational, risks and rewards on developing geothermal energy in Hawai'i. Ms. Wilson mentioned that many group members did not have knowledge of geothermal energy. Therefore, rather than research everything on geothermal energy they decided they would be meet with organizations that had the expertise in this field.

Ms. Wilson briefed the members on past resistance by the native Hawaiian community. Their concerns included:

- Religious beliefs and customs
- Cultural and subsistence customs and practices; including access
- Hawaiian cultural sites
- Protection of burials and 'iwi kupuna
- Health issues from emissions
- Transmission lines through NARS and DHHL lands
- Ceded Land exchange
- Destruction of rainforest
- Impact of pollution on native birds, fauna and flora

Ms. Wilson distributed a handout on the "Legal Ramifications for Hawaiian Subsistence Practices and Rights and a timeline on Social Process in Hawai'i.
(See Attachment "C, D")

Ms. Wilson stated what the members need to be kept in mind about the native Hawaiian community is that the environment shaped them as "a people." The environment is key and critical as part of the Hawaiian foundation. It is important to understandwhere can a Hawaiian be a Hawaiian if not "Hawai'i?"

Ms. Wilson said that native Hawaiians are concerned about having to sacrifice their religion, cultural lifestyle, and identity for the benefit of others. These concerns need to be acknowledged, respected, and addressed.

Ms. Wilson recommended that the Geothermal Energy Working Group conduct listening tours. It is necessary to meet with the native Hawaiian community and receive input from them. She encourages the GEWG to meet and "talk story" with the Kupuna Advisory Group at the Hawai'i Volcanoes National Park. They have very diverse issues and they represent various backgrounds. The group consists of educators and former park employees who can offer their valuable contribution.

Ms. Wilson in addition recommended that the GEWG include a cultural impact assessment to the Legislature with their report.

Ms. Wilson mentioned that geothermal royalties are shared between the State, OHA, and the County. She suggested that there be consideration to create a special fund for educational purposes. It is important to look at future generations who will be involved in the development of geothermal energy. Ms. Wilson informed the members that the University of Hawai'i at Hilo is preparing a proposal for an engineering program. A special fund could assist our youth by offering them an internship program in engineering. It is necessary to educate the future generation that will be one day running these facilities.

Ms. Wilson informed the GEWG that her group called "Papahuilhonua" created a website in order to provide information on geothermal and to use it as a bulletin board for upcoming events. The website address is www.papahulihonua.blogspot.com. The video from the symposium is also available on the website.

Ms. Wilson entertained questions from the Geothermal Energy Working Group.

Co-Chairman Ha stated that the Mayor directed the GEWG to meet with the community. He asked Ms. Wilson if she could suggest who the members should meet with to "talk story."

Ms. Wilson will provide the members with an outline that was developed identifying key individuals within the community.

Co-Chairman Ha commented that if Geothermal Technical Advisory Committee is reactivated and zones are identified they could meet with those specific communities to discuss the environmental and cultural aspect within that zone.

Co-Chairman Ishibashi stated that it very important to address the cultural and environmental impact in order to expand geothermal. He questioned how the GEWG should proceed with community discussions.

Ms. Wilson suggested that the members meet separately with the community associations, and also with the Kupuna Advisory group.

Mr. Kahawaiolaa recommended that the group travel to each district to meet with the each association.

Ms. Wilson named other individuals associated with her fellowship group. She will provide the members with a list of those individuals.

A member from the public inquired on how the royalties were divided.

Ms. Wilson responded that the royalty percentage is as follows:

- State – 50 percent
- County – 30 percent
- OHA – 20 percent

FUTURE MEETINGS

The members agreed on the following:

- Meetings will be scheduled through an email poll. Ms. Andrea Gill will assist.
- Committee on Scheduling Community Meetings:
  Richard Ha, Pat Kahawaiolaa, Bob Lindsey, and Jay Ignacio volunteered to be on the committee.
- A preliminary report will be completed by November 30, 2010.

UPCOMING AGENDA ITEMS

- Reports by subcommittee chairs
- Timeline on interim report

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Staff Secretary

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
Hamakua Conference Room
25 Aupuni Street
Hilo, Hawai'i 96720

Minutes of Geothermal Working Group August 26, 2010

Attendees: Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Chairman Richard Ha calls the meeting to order and asks for any public statements. Kristine Kubat, a community and environmental advocate, addresses the group. She states that she intends to be a "watchdog" for the community and protect the public's interests by monitoring developments with geothermal energy operations and expansion at Puna Geothermal Venture. She also states that she suspects that there has been a lack of full-disclosure concerning past problems with PGV -- specifically, a "blowout" that occurred some years ago. She suggests that the lack of disclosure fuels suspicions in the community that the operation of the PGV electrical generation plant is dangerous to people and the environment. Finally, she admonishes the Working Group not to be an advocate for geothermal energy.

Chairman Ha advises Ms. Kubat that the Working Group is not under the sunshine law and is, therefore, not required to provide the public with access to the Working Group meetings or their findings. But, it is the Working Group's intention to keep the process open and the public is welcome to speak.

Chairman Wallace Ishibashi, Jr. thanks the speaker for her comments and asks, "How do you propose we move forward to address your concerns?" She responds that public meetings be scheduled and the community notified of the places and times. Chairman Ishibashi says that the processes the Working Group uses are still evolving, but that the speaker has valid concerns and that the community will be an important factor as the Working Group moves forward. He asks her to comment on the current conditions of the

PGV plant. She states that it has been operating for decades and appears to be safe -- that she knows of no emergencies or failures that threatened the public or the environment -- but, that there are still "a lot of suspicions" because the public doesn't know everything. She advises that there should be transparency in the process. She said that no overtly pro-geothermal information should come out of the Working Group's report. She said a community apology is needed; she proposed using the Pahoa Community Center. Also, there are rumors of the dumping of chemical toxins at PGV.

Chairman Ha asks if any other member of the public wishes to be heard. There is no response. Chairman Ha introduces Mitch Ewan who will give a presentation to the Working Group today.

James "Mitch" Ewan - ewan@hawaii.edu - Hydrogen Systems Program Manager - Hawaii Natural Energy Institute - University of Hawaii
1680 East-West Road, POST 109, Honolulu, HI 96821.
Technologist and applications specialist. Mitch had been in the hydrogen business for twenty-five years.
OFC: 808-956-2337
CELL: 832-212-6129
FAX: 808-956-2336
Presentation: Hawaii is the most petroleum-dependent state in the union. The County of Hawaii spends $1 billion per year on petroleum. By 2015 the projected cost of a barrel of oil will be over $200. Both transportation costs and business costs will be affected. However, Hawaii has sufficient renewable resources that can be developed to supply all of Hawaii's future energy needs. Big Island has 150% of resources compared to projected needs. Geothermal is the most effective, efficient, and fairly inexpensive to produce. Photo-voltaic is the most expensive to develop; wind is the least expensive. If energy is used to produce hydrogen, the outlook is especially promising.

The Clean-Energy Initiative mandates that 70% of Hawaii's energy be clean and renewable by 2030. Hawaii exports a lot of money for energy. Energy that Hawaii locally produces will keep money in the state and translate into more local jobs. Funding is available from various government agencies. For example, a public bus system for the Puna district is being developed that will use hydrogen fuel supplied by the PGV plant. US DOE is funding the buses.

Hydrogen can be produced from geothermal, wind, and biomass. 60% of municipal waste that is already collected (and whose biomass energy potential is lost when dumped) can be converted to fuel.

The GM Equinox runs on hydrogen - GM will introduce 100,000 vehicles to Hawaii as a testing site; the marine base on Oahu will be using this vehicle. Hydrogen can be used to store energy. Richard Ha asked what are the chances of bringing these cars to Big Island and Mitch Ewan said that there is a very good chance -- especially if refueling sites were in place. GM already has an office in Honolulu. Volcanoes Park diesel buses will be replaced with fuel cell buses.

The state has a $10 million fund for entrepreneurs who develop clean energy. There is a hydrogen fund. The Hawaii Center for Advanced Transportation Technologies (HCATT) was first established in 1993 as the Hawaii Electric Vehicle Demonstration Project to represent the Hawaii Consortium in the Defense Advanced Research Projects Agency's Electric and Hybrid Vehicle Technology Program. In 1999, it transitioned to the Department of Transportation's Advanced Vehicle Technology Program, and in 2001 it formed a partnership with the Air Force Advanced Power Technology Office and established the National Demonstration Center for Alternative Fuel Vehicles at Hickam Air Force Base in Honolulu. HCATT will be doing the Volcanoes Park bus-engine conversion and works with the USAF. Clear Fuels is a fuel company that develops hydrogen fuel through conversion of biomass.

Mitch Ewan is an advocate of the community-sized conversion plants, rather than large-sized mega-conversion fuel plants. Fuel facilities already exist on Oahu with plans for new construction. Big Island has a small wind-turbine automated plant to produce hydrogen that can be controlled over the Internet on the Kahua Ranch. Took a year to develop but works well.

HNEI will provide hydrogen to Volcanoes National Park for the fuel-cell buses. HNEI uses an electrolyzer. Park Services is working to get the approvals. $1.2 million funding from DOE. $1.2 million from State of Hawaii. 2 million visitors to the park will learn of the project. Target date: January 12. Hydrogen station is built and will soon be shipped to Hawaii. The movie theater and visitors center will be powered by hydrogen. Big Island can be ringed by hydrogen fueling stations and shuttle buses can provide a feeder service from people's homes in Puna to hydrogen-powered buses that will operate throughout the county.

Hydrogen will be used also as an energy storage system -- to take the extra PGV electricity for hydrogen conversion to be stored. Fertilizer is a by-product of the conversion and reduces agricultural costs. Fish farms can use the oxygen from electrolysis.

The Hawaii grid is at maximum for metered renewable energy since a petroleum generator must be in standby mode due to vagaries of wind and sun. A large electrolyzer can meet the power fluctuations in the grid while it is producing hydrogen and oxygen. Ammonia is a safe way to store the hydrogen and transport throughout the islands.

Question from audience: How large a roadblock is permit processing from the government?
Answer: If the power is produced for sale, rather than exclusively for the grid, permits would not be required.

The electrolyzer produces hydrogen and oxygen; nitrogen from the air can be combined to produce ammonia (NH3). 12,000 kWh can be produced for each ton NH3. 30

kilograms of hydrogen is equivalent to 30 gallons of gasoline. GM cars have a range of 150 miles on one tank of fuel.

Tube trailers (gas cylinders on trailers with safety features) dispense fuel and can be used as mobile stations. After proof of the concept is accepted the smaller electrolyzers will be replaced by larger as the operation becomes financially viable.

Question from Working Group: How much does it cost to run the fuel-cell bus system; is it sustainable or is funding required?
Answer from Mitch: Initially, subsidy funding will keep the project viable; an analysis of the trial-phase of the demonstration project will illuminate the hidden expenses. The geothermal-plant electricity will keep the greatest expense -- process electricity -- at a minimum. That fact attracted the DOE's interest in funding the demo project.

Question from Working Group: What is the cost for the electricity for the system already in operation?
Answer from Mitch: It is about 23 or 25 cents per kilowatt-hour on Oahu; we haven't negotiated a price with PGV, but we expect it to be about 5 to 7 cents per kilowatt-hour.

The reason the national park is being used is because there are vehicles there that the park service wanted converted, not because it is federal money funding the project. The reason the GM cars are on the military base on Oahu is because the the vehicles are prototypes and very expensive. The portable fueling stations are intended to be towed by hydrogen-powered trucks. The technology to store and transport the hydrogen fuel exists and is used everyday in many places on the mainland. The low-pressure systems are safe and inexpensive. Similar systems can transport fertilizer to farms and fuel to transfer stations.

Mitch showed slides of the GM hydrogen vehicles. Initially, the US Army is getting five, the US Navy is getting five and the US Air Force is getting five. Eventually, thousands of the vehicles will appear on the islands as GM rolls out the models for testing in Hawaii.

Several government and non-government entities can contribute tax money and grant money to the projects and need to be approached as soon as possible with requests for funding. When it transitions to a profitable commercial operation then local businesses will have an interest in backing the projects.

Question from the audience: What's the conversion cost between hydrogen and gasoline? Would car-rental companies be interested in using the fuel-cell cars in their rental fleets?
Answer from Mitch: It takes 60 kilowatt-hours to produce a kilogram of hydrogen - so, depending upon the cost of electricity, it can be competitive with gasoline, especially with a fuel-cell vehicle as opposed to a hydrogen gas vehicle. As the price of petroleum rises, the hydrogen fuel becomes more competitive and businesses can be certain what their fuel costs will be, rather than being at the mercy of foreign markets.

Question from the Working Group: How long before there are commercial quantities of hydrogen being produced?
Answer from Mitch: I'd give it the five-year window depending upon funding. A commercial electrolyzer can kick out a lot of hydrogen, but they are expensive - on the order of $2 million. In one year the parks buses will be working. Until the general public buys hydrogen cars or converts their cars, the fueling stations will be available, but under used.

Question from the Working Group: Can you explain how the hydrogen fuel-cell works.
Answer from Mitch: It is similar to a battery design; there are two gases, hydrogen and air, separated by thin plates that allow interaction with one another aided by a catalyst. In the process of combining together they create electricity. The electricity is used to power an electric motor.

Question from the Working Group: Do you anticipate that the fuel-cell car will replace the battery car?
Answer from Mitch: No, both technologies will coexist and improve over time. The fuel-cell works like a hybrid.

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After the presentation, the Working Group discusses the minutes from previous meetings, makes required changes, and formally approves the minutes. Richard Ha introduces administrative volunteer, Christopher Mann. Working Group discusses Sen. Kokubun's recommendations concerning what form the Legislative Interim Report should take. Chairman invites volunteer to discuss mechanics of compiling data and shaping the report through email and email attachments. The volunteer will act as editor and return the material to the Working Group so that all members can see the text of others and the progress of the overall document.

Nelson Ho suggests the Working Group determine the specific and substantive issues for the foundation of the report. Jay Ignacio asks the administrative volunteer to clarify how he will be assisting the Working Group.

Wallace Ishibashi recommends that all the sub-committees submit their text to the administrative volunteer who will put the material into an agreed-upon format and then distribute that to all the members of the Working Group.

Nelson Ho suggests that to start, an objective set of bullet points would give direction to the writers, who would then offer their own expectations and bring their own expertise to the project. Nelson Ho suggests the report include energy resources that credibly compete with geothermal.

Jay Ignacio states that the Working Group needs to know what specific writing assignments each member has.

Wallace Ishibashi recommends that the administrative volunteer create a list of writing assignments and provide that list to Richard Ha.

The administrative volunteer offers Richard Ha a list that is a synthesis of statements from SCR 99 that can be used as bullet points to make writing assignments. The Working Group agrees to continue the meeting and make the writing assignments from this list and some additional considerations.

Patrick Kahawaiola'a states that although public perception may be mixed learning that Jay Ignacio sits on the Working Group - as if HELCO might have undue influence -- nevertheless, the group needs his expertise to make the best recommendations to the legislature. Patrick Kahawaiola'a inquires that, since it is HELCO's position that further expansion of the electrical grid will not include petroleum-based generators, will geothermal be the number one alternative or will other types of electrical energy generators will be used?

Jay Ignacio states that given the practical considerations of increasing demand, design dependability, and past history, at this time it would be unwise to depend entirely upon geothermal plants for the island's energy needs. A statistical analysis of probabilities will likely tend toward a mix of alternatives and fossil-fuel generators. The utility and prudence of keeping fossil-fuel energy available to the grid represent the most reasonable approach.

Barry Mizuno opines that demand for energy of all sorts, transportation as well as electrical house power, will doubtless increase. Accepting that fact, Hawaii is best served by developing resources that are available locally rather than depending on resources that the island doesn't have.

Nelson Ho and Patrick Kahawaiola'a agree that it would be helpful if Jay Ignacio could provide specific energy-demand projections and potential resources to meet those needs so that they could approach communities that would be affected by construction of power plants, present the facts and ascertain public reaction.

Richard Ha states that there have been changes to conservation land rules and changes to sub zone protections that the Working Group needs to be aware of.

Patrick Kahawaiola'a states that if all the geothermal plants are scheduled for construction on protected lands, everyone might as well go home.

William P. Kenoi
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Geothermal Energy Working Group
Hawai'i County Building
Puna Conference Room
25 Aupuni Street
Hilo, Hawai'i 96720

Minutes of Geothermal Working Group October 11, 2010

Present: Andrea T. Gill, Ted Peck, David Matise for Carlito P. Caliboso, Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Guest Speakers:
Patricia Brandt, IDG CEO/Board of Directors
Mililani Trask, Indigenous Consultants
Roberta Cabral, IDG Senior Advisor
Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

John Olsen, a member of the Puna community: John Olsen is not representing the Sierra Club at this meeting. He states that for 20 years he has experienced trouble. People are making a political decision rather than scientific or economic-based decision. He is very familiar with the development of geothermal energy. Mr Olsen expresses concerns that decisions based not on costs or accurate projections. Cost / Benefit - information has not been shared. Quotes the MIT Chair of Energy and offers a handout of the professor's opinion that Solar Energy is the best choice.

Steve Dearing, project manager for Kealoha Energy - filling in for the designated speaker, Ms. Kuulei Springer, who could not attend today - developing a 25 to 30 MW facility to replace the oil-burning plant in Hilo. The late James Kealoha was founder of the company. Cost is $3 million per MW. Proposes a $90 million plant for Puna. Time to become self-sufficient and

cease the oil-based energy power system. He advocates geothermal as part of non-fossil grid generation. 89 acres already designated for geothermal and ready to drill test wells. Rates on Hawaii are higher than on mainland. Proposes Kealoha Energy will cut electrical rates and create jobs. Local residents can be hired to work for Kealoha Energy. Many companies are ready to do the construction. Property will be leased to operator for percentage of profits. Asks for Working Group's support to have Kealoha Energy provide clean and reliable energy. Co-Chair Richard Ha invited the company to make a formal presentation to the Working Group. Mr. Dearing states that paying 35 cents per kilowatt hour "is obscene." Geothermal Developments is a small company, but will partner with larger groups to get the job done: possible growth to 70 MW. Contact and information at: kealohatrust.com.

Member Nelson Ho. stated it was the first time he was aware of another geothermal proposal in Lower Puna and concurred with Chair Ha in requesting that Kealoha Trust and Ms. Springer be formally invited to make a presentation.

Mr. Dearing states that he has not been able to get through to the Working Group. He is not a fan of the Sierra Club. He was offended that his presentation was not warmly accepted. ORMAT has held up the Kealoha development for 17 years.

Moani Akaka: Was in a photograph when the geothermal well had a caustic blowout in early days. Has reservations about geothermal. However, if it is to be done, it must be done properly to avoid the problems of the past. Local community was adversely affected by failings of the first plant. Says geothermal should be owned by local population and benefits provided to local population. The geothermal price should not be the same as oil-based electricity. Hawaii should not be industrialized like Pittsburg; ORMAT is obsolete - 3 decades without benefit. Working group must prove that geothermal is safe. Insulted that anyone would demean the Sierra Club, who protect the aina.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: hopes for success of the working group, however, the group seems to advocate PGV to the exclusion of alternatives, like an addict to replace fossil fuel with geothermal injected into the same system. Other ways could be available, direct-use applications, jars sterilized for food sold at farmers markets, for example. Small-scale technologies are a potential. If oil runs out, H2 generation from excess PGV production is a good idea, but for community, not just tourists. Mitch Ewan's idea to develop hydrogen buses was initially for tourists - not the plan has grown to include community transportation. Compressed air may be superior to hydrogen. Danger is alliances that are formed between existing groups to protect the status quo - others need to be represented and future generations must benefit, also. Think ahead and progress is possible.

Co-chair, Wally Ishibashi states: this is not a PGV committee and that the Working Group is willing to listen to all voices and alternatives.

Member, Ted Peck states that Mitch Ewan is under contract with the Energy Administrator to fulfill the Hydrogen Fund.

Member, Patrick Kahawaiola'a advocates going to communities to receive the public's energy concerns - anyone willing to schedule a meeting, please do so. The host culture should benefit from developments and improvements in the state.

Moani Akaka: Office of Hawaii Affairs receives revenues from ORMAT - the Puna community should benefit more and that benefit should be visible.

Co-chair, Richard Ha: attended Peak Oil Conference in Washington, DC. Reads from website. Platts News Service is a leader in providing energy-related news regarding energy price assessment. A panel of geologists and energy analysts debated Thursday the severity and timing of an anticipated oil crisis, with one saying during a Washington briefing that crude oil production has now peaked.

"The global rate of production of oil is peaking now,"said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin. "The size of accumulation [of oil] is not equated to the rate of production," he said. Frank Rusco, an energy director at the US Government Accountability Office, estimated some 45 years of "proven reserves," though current and future oil demand will stress supplies.

"Higher oil prices can retard economic growth and even cause a recession in the right circumstance," Rusco said at the briefing, which was organized by the Association for the Study of Peak Oil and Gas. He declined to say after the briefing what a gasoline price ceiling might be for US consumers. "The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," Rusco said, citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper." Meanwhile, "mitigation of oil dependency by transitioning into other energy sources will take upward of a decade to come into play. "Sometime after a decade, mitigation will take impact and things will start to flatten out," Hirsch said.

New reserves from Brazil and production from unconventional sources in the US will not be enough to compensate for depleting reserves, panelists said. The Ghawar oil field in Saudi Arabia, still a bright light in the petroleum world, could see a sharp and imminent decline in production, Patzek said. If Ghawar "peters out, to replace it [with production elsewhere] will be a very difficult task," he added. He estimated Ghawar's current production at between 4.5 million and 5 million barrels per day, though added that actual production figures are unknown as they are a "top secret."

Later, on the sidelines, Patzek said Ghawar could become the region's Cantarell, referring to Mexico's offshore oil field that has seen production plummet by over half from a peak 2.1 million barrels per day in the mid-2000s. Patzek said that the ongoing water-flood efforts into the Ghawar field to stimulate production will eventually taper off. "You're injecting twice as much water into the well," he said. "Your field is watering out," Patzek said in an interview

Patzek told the briefing that Norway's reserves have peaked, while he characterized the decline rate in the US Gulf of Mexico as "very high." BP's Thunder Horse well in the Gulf "has not reached its potential and it's declining faster than people thought," Patzek said. A BP spokesman was not immediately available for comment on Patzek's remarks about Thunder Horse.

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference. "This is not a recovery that we're in," said Nicole Foss, a former fellow at the Oxford Institute for Energy Studies, who predicted "chaos" in foreign currency and equity markets within years. A severe deflationary plunge will contribute to a liquidity crisis among the financial sector, Foss said on a peak oil panel late last week. The meeting in Washington wrapped up Saturday.

"Oil will bottom early in this depression," Foss said. She and fellow panelist, energy analyst, Chris Martenson, predicted that foreign currency markets will become more volatile, with domino effects on global money supply. "It's not unthinkable the the US will have another financial crisis," Martenson said, adding that he gave the US a "50%" shot at having a fiscal crisis and a "50%" chance of experiencing a currency crisis. "We're going to see severe dislocations in the foreign exchange markets."

Deflation is tomorrow's problem," Foss said, adding that a lack of purchasing power will undermine price support for crude oil. Then "printing [money] is a few years off," she said. "We could see $20 per barrel and then $500 per barrel within the space of five years," Foss said. Foss runs the Agri-Energy Producers' Association of Ontario, where she has focused on farm-based bio-gas projects and grid connections for renewable energy. At Oxford, she researched electricity policy at the EU level, according to her website. She was previously editor of the Oil Drum Canada, where she wrote about peak oil and finance.

Speaking on the sidelines of the conference, Foss said that natural gas holds no promise as a safe hydrocarbon haven in a scenario of volatile crude oil prices. There is a "perception of a glut" of natural gas reserves and other resources from new shale plays and coal-bed methane and tight formation gas Foss said. "I would argue that this is an illusion," Foss said. The environmental cost of extracting unconventional resources "is tremendous," Foss said, adding that the energy resource "bang for buck" is unappealing. "We'll end up with natural gas price spikes, "after years of low natural gas prices," she said.

As demand out paces supply, the urgency to do something to anticipate the crisis becomes greater. Hope replaces shock if we agree that we can figure out ways to help fend off the panic 2 to 5 years away from oil spike - lowest economic group will suffer the most when prices rise. An analysis of $200 per barrel oil, even without great detail, it would be devastating to the Hawaiian economy.

To compare: 35 acres of geothermal equates to 35,000 acres for bio-mass -- 7 cents per pound if farmer were to grow bio-mass without subsidies -- it would never happen.

Member Nelson Ho suggests to discuss these matters later on in the agenda to permit presentations would be more appropriate.

Presentation by Innovations Development Group - Patricia Brandt, CEO/Board of Directors, Mililani Trask, Indigenous Community Advisor, Roberta Cabral, Senior Advisor. Office email: info@idghawaii.com.
Michele, Staff Assistant. Ryan Matsumoto.

IDG has 10 years experience with geothermal and represented the Maori of New Zealand in three energy-development projects. The overarching approach is to respect human rights while developing energy resources: Native-to-Native process. IDG is an Hawaii-based strategic planning company that is focused on renewable energy development. IDG wants Hawaiians to control their own resources. In New Zealand, the Maori Queen and IDG developed plans to coordinate contacts with the experts to develop locally-owned resources. Equal representation is the key to a successful geothermal drilling. Improvements in technology are required to avoid toxic venting of gases, adverse impacts to the environment, and to provide for the general benefit of the community. IDG provide expertise choosing the best project, the right developer, and training for local people.

Mililani Trask presented an outline of the Native-to-Native model -- recognize human rights of homeland to benefit from development. Must address climate change and renewable resources. Old model of resource exploitation is outmoded. UN declaration for human rights is the foundation to the development model - preserve cultural heritage - environmental sustainability - socially responsible. Hawaii most at risk for shortage of fuel due to dependency on energy - Hawaii County is the largest landmass in US capable of being energy self-sufficient. Development of firm-power geothermal needs tax incentives - policy needed that recognizes geothermal is primary resource of ceded land trust. Carbon footprint shared by all who drive and use energy. Geothermal development requires a community collaborative model - equitable sharing of resources. How do Hawaii Renewable Energy Development Venture describe stakeholders? It shows who you are dealing with. Mostly corporate members are stakeholder. No local representation. Need cultural affiliations - equitable and fair - need to comply with legislation. Ignoring cultural considerations led to court proceedings. Also, it was cheap and filthy technology that led to geothermal blowouts 20 years ago. Need appropriate technologies for Hawaii's conditions. Environmental issues need to be addressed at the planning stage. Hawaii paying the highest rates for electricity in the country due to lack of participation in negotiations at early stages.

Pele Defense Case set standards - deviated bore (drilling at an angle) provides access to resources that lie beneath environmentally-sensitive areas. Community involvement needs to move first.

Three Economic Models: 1) ORMAT type is Build-Own-Operate and transfer of benefits years later 2) Royalties are pennies on the dollar - not equity benefits - fixed fees per MW 3) Equity owners at all levels are invited to sit at the table. Participation means shared income.

Roberta Cabral - The general public and native interests are vested in indigenous mineral and geothermal is a mineral. Initial investment in research is critical for later negotiations with investors and developers. The negotiation model leverages community, investors, and developers interests. Need to partner with bonafide geothermal developers. IDG proactively seeks support of local population with Community Collaborative Model. IDG specializes in community connections as well as understanding that geothermal shall not be the exclusive resource - but, an important resource. Risk is capable of being measured - that relates to the cost of capital - Collaborative Model structures a PPA (Power Purchase Agreement) with percentage of surplus cash dedicated to the developer and share a percentage of the proceeds in a community trust. IDG provides protection for developers by paving the way for community partnership. The community receives benefit from the trust.

Member, Ted Peck states that there is some question as to whether or not the PUC would approve this type of trust with money going into it. The legislature must set policy for this type of model - community equity - change in model now - cannot undo what contract-in-place stipulates under Hawaii's constitution.

Roberta Cabral - money from project to community can be used for stewardship; trust fund goes to community's benefit: parks, businesses, educational scholarships, farming, fish tanks, fish drying, spas, etc. Technical and financial partners chosen by IDG, who assume risk. IDG strategy is to bridge the gap between community and developers. IDG thinks geothermal is the way to go.
IDG wants to be selected as a preferred geothermal developer. IDG has the experience and the expertise to do the deals.

John Olsen, a member of the Puna community, states that actually it is the community that takes all the risks - money is just paper. The evacuations of Puna residents due to venting demonstrated that fact.

Member, Nelson Ho requests a copy of the IDG presentation to be reviewed in detail by the committee.

Co-chair, Richard Ha, suggests IDG create a proposal for legislators.

Member, Jay Ignacio states - need to balance disclosure to legislation and proprietary information of IDG's. Since SCR99 directs the Working Group to report on establishing a community-benefits package, IDG's model may fulfill that requirement.

Member, Ted Peck states that the community-equity model needs to be articulated and some statutory language may be the starting point.

Presentation by Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii - guy@EnergyFutureHawaii.org
Speaking about the NH3 Energy Conference in Detroit.
NH3 is ammonia and the point of the conference is to demonstrate that ammonia is a good way to carry energy. Geothermal is a good way to create ammonia. Expansion of geothermal

must occur first - before secondary industries can be established. Farmers need fertilizer to get nitrogen into the soil. Ground transportation is the single largest use of fossil-fuel energy, so load varies with tourism in Hawaii. Geothermal can be used for ground transportation, as well.

Off-peak hours, curtailment which could mean waste (with fossil burning) or production if used to convert water to H2. Electrolyzers are used. H2 can be used to fuel transportation, but H2 vehicles don't represent a very large part of the transportation system. So, at 2008 Conference, the speaker, Richard Ha, asked Guy about converting H2 to ammonia. HNEI slide - ammonia is the practical man's hydrogen. Synthetic Urea (a dry form of ammonia fertilizer) accounts for 3.6 tons of NH3 per day on island farms. If geothermal were expanded to 720 MW it would create enough gasoline-equivalent can provide fuel for all autos on Big Island. The Dept of Energy with matching state funds have a pilot project to build and maintain 2 hydrogen fuel buses.

Member, Ted Peck states meeting with Mayor today and discuss feasibility of transforming all county buses to H2 and what is timeline.

General Motors and fuel companies are introducing Project Driveway - vehicles that use H2 and an infrastructure to support it.

Ammonia is a good way to move energy. Ammonia to Oahu for power instead of the expensive power line. Ammonia is denser with hydrogen than liquid hydrogen. Ammonia could be an exportable commodity. The energy conference demonstrated many different research designs that used ammonia as the fuel source. Renewable Hydrogen Network - Japanese graphic of renewable ammonia combined with H2 and O2 for best fuel. Injection of water into ammonia improves fuel characteristics.

Member, Ted Peck asks about the capital investment for ammonia plant - Guy Toyama will provide the report. Mr. Peck needs to leave for another meeting.

-- Ten-minute recess --

Co-chair, Richard Ha: Call back to order

Working Group Members discuss the Geothermal Interim Report for Hawaiian Legislation - Format and content

Member, Nelson Ho states some concerns: that the working group is not ready to answer / address all aspects of the information required for the legislation 1) revenue sharing - especially for the least represented 2) impacts to PGV neighbors: air quality / noise 3) DNLR's role in process 4) regulatory agencies' input 5) all forms of energy have subsidies - stated or not - need scientific information regarding expansion of PGV's present capability.

Co-chair, Richard Ha: Need to discover from Working Group Member, Bob Lindsey - where does the money go - what benefits?

Co-chair, Richard Ha asks Working Group Member (HELCO), Jay Ignacio, what needs to happen to take the next step?

Member Jay Ignacio says a Resource Plan will address what mix of resources will be used going forward. Clean Energy Scenario Planning (undefined at present) - Identify the resources, location dependent, stability is essential. HELCO will produce a study, but not the official public utility plan, outlining the integration of resources. The essential requirement is to move from high-level discussion to defining the specific resources and their particular locations and capabilities. Geothermal is an option, but without certainty of investment, developers won't begin building and without existing facilities, HELCO cannot plan assuredly to integrate into the grid.

Member, Andrea Gill: Needed are detailed resource assessments defining the scope of available energy and how it can be developed. There can be no absolute certainty about a resource. Only drilling and actual steam production will verify - so need to find the level of comfort in planning using exploration data to project future growth and integration of new power plants. Also, Kealoha Energy's plan is more preliminary than has been asserted.

Member, Jay Ignacio says that working with researchers to identify high-probability resource locations is a first step, the determine how development will be funded.

Member, Nelson Ho: Regarding baseload growth of power production, what is the recommendation according to HELCO's last completed plan? What estimate did HELCO make in terms of baseload growth in MWs? What's the preferred type of plant?

Member, Jay Ignacio: Theoretically, all fossil-fuel power plants could be replaced. If the resource is viable and a benefit to HELCO's customers, the PUC would approve a change to geothermal plants. Last filing of projections predicted a 2010 need above 200MWs peak. Presently, peak is about 185MW. That means the plan for bringing on a firm, large-capacity generator in 2020 can be pushed further, since demand has not reached projected growth. On-site generation and the economic downturn altered the growth in demand. In 2022 or 2023 there is a plan to bring on another geothermal plant, but not sure how it will come about. The preferred type of plant meets the needs of the customer: reliable, low cost, and no adverse impact on the environment.

Member, Andrea Gill: Can HELCO's contract with Hamakua Energy be displaced with expanded geothermal?

Member, Jay Ignacio says HELCO has a thirty-year contract with Hamakua Energy that goes out to 2030. They are compensated in two ways: 1) for being available - capacity and 2) for the energy HELCO uses.

Member, Patrick Kahawaiola'a asks if geothermal at PGV is producing at capacity and if HELCO is buying all power produced. What resources can provide electrical system stability in addition to fossil-fuel plants?

Member, Jay Ignacio says HELCO curtails purchase of power from PGV at night. Shows a graph of the electrical load profile. As demand decreases, certain plants can be curtailed. Oil-fueled steam plants cannot be taken off-line without rendering the system unstable. New designs of geothermal will have the reliability required to ensure stability to the grid, but the current design at PGV does not and, hence, cannot dependably and safely displace the oil-fueled plants. But, in parallel with exploring alternative energy resources, HELCO is exploring alternative fuels. Bio-mass may not be the answer, due to economic constraints, but alternative fuel sources are an option.

Kristine Kubat asks Jay Ignacio if HELCO sees itself as a developer of alternate energy and alternate energy resources?

Member, Jay Ignacio states that HELCO is flexible in the matter of bringing new resources to the system. The utility has the burden of providing service. An independent provider does not have an equivalent responsibility. If HELCO retires its plants and is no longer financially viable, it cannot provide the service as mandated by the public.

Member, Nelson Ho says it is the nature of geothermal that it cannot be throttled back to match demand, the steam is thrown back into the earth and wasted.

Member, Jay Ignacio says that using geothermal energy independent of the electrical power grid would permit more geothermal to be developed effectively and, for example, electrical transportation would provide that use. Nevertheless, geothermal's short-comings have to do with the technical/engineering side and the geophysical limitations of the resource.

Member, Nelson Ho says that the geophysical limitations are what John Olsen and Sierra Club have been pointing to all along. The resource is about pinpointing discrete water and rock formations that have desirable characteristics and that operation is problematic has a great deal of risk and uncertainty associated with it.

Member, Jay Ignacio says that the trouble is often the extraction; wells get clogged and can no longer produce, so other wells have to be drilled to replace them.

Co-chair Richard Ha asks if it is about the return on investment - if enough wells are profitable and productive, the systems works well. It is about managing the resource.

Member, Nelson Ho says that if the relevant problems are defined in the Interim Report, the group will be on its way to providing information to help solve the problems.

Member, Jay Ignacio says the problems with accepting photo-voltaic energy and the contracts that exist with wind could mean that later contracts are turned away before older commitments. So, even if geothermal proved to be less expensive, HELCO might be prevented from buying it.

Member, Patrick Kahawaiola'a says people outside of the working group don't understand that part -- and need to be told. If geothermal will be available at 6 cents per kilowatt, but HELCO has to pay 35 cents for wind because of an oil price spike, people will be confused and angry.

Co-chair Richard Ha says that the inter-island power connection starts to make practical sense - especially, as resources costs rise.

Member, Andrea Gill asks, is HELCO paying 15 cents avoided-costs for wind regardless if it is firm or intermittent?

Member, Jay Ignacio says, Yes. Contract exists for a long time. If we don't take aggressive steps to expand geothermal, especially if oil prices go to $200 per barrel, there will be problems supplying energy to meet demand. It will take time to prove reliability and come to be a dependable part of the system. It is at least a year to bring a plant online. How well that source will be managed is fundamental to the level of confidence. Plants cannot be retired until there is demonstrated reliability and a redundancy in case of problems. Propose that HELCO runs two simulations to provide data on how transmission expansion scenarios would play out.

Member, Andrea Gill says new resource data is needed to remove uncertainty regarding growth and stability. Landowners can request to be in a subzone or removed from a subzone if it appears a resource is there. Need to work through the DNLR. The DNLR can create a committee as it did before. Currently outlining the issues for the Interim Report.

Next meeting have a draft of report to look at. Propose November 8, 2010 as date for next meeting.

William P. Kenoi
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Geothermal Energy Working Group
Hawai'i County Building
Puna Conference Room
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Minutes of Geothermal Working Group November 8, 2010

Present: Robert Lindsey, Ted Peck, Carlito Caliboso, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: states that she has read the Working Group Interim Report draft and objects to the optimistic language regarding geothermal. Petroleum analysis is plentiful, but there is limited analysis for geothermal. Despite the fact that Big Island is located above a geothermal hotspot, the resource available for geothermal may be depleted. In her estimation, geothermal is not a renewable resource. She says that the report should so state. She objected to the statement: a resident could have their property removed as a subzone designated for geothermal if the resident so desired. The petition is difficult for people to do. Also, she asks for facts about HELCO plans to retire oil-fired generators. Also, she asks PGV to come forward with facts. How much does it cost to build a geothermal plant. The concept of firm-power for baseload needs to change. Depletion, firm-power, geothermal resource subzones all need to be defined clearly. She wants to make some recommendations in the final report.

Jon Olsen, a member of the community, says he and 87 others withdrew their properties from the designated geothermal subzones. The state did not respond favorably to their certified letter. He has copies of legal filings and he will provide when necessary. He expresses his concern that the current evacuation zone around PGV hasn't been discussed.

The EPA requested that the state and county create a notification program and that has not occurred. There is a concern about heavy metals and sulfur being released into the environment around PGV. He believes every chemical is within seawater, many are dangerous, and the geothermal plant wells may release them.

Steve Phillips, a member of the Puna community, had a bad experience with geothermal before. He said that the law should be changed to permit a contested case hearing. Any new development that impacts the community must uphold the rights of those in the neighborhood. He stated that geothermal gases poisoned his son in his crib. He stated that he lost his marriage because of geothermal. His property values went down because of geothermal. He said he wrote rules for a geothermal asset fund that were never used. How will the mess of a decommissioned plant be funded when it needs to be dismantled? That is what the asset fund is for. He will do everything in his power to halt geothermal development unless the community has a contested case hearing. The community led to improvements over the poorly designed and built experimental well.

Robert Petricci lived in the neighborhood during the development of geothermal and was evacuated years ago when there was an open venting. He also wants a contested case hearing. There will be problems if geothermal is built where people live. Also, geothermal developers must not cut corners during construction.

Member Robert Lindsey says he thinks a contested case hearing is a good idea and fits in with SCR 99. To move forward with geothermal means that we must contend with some of the past errors.

Co-chair Wally Ishibashi says everyone knows some things were done wrong in the beginning, but we are moving in the right direction now. Everyone wants things to be done correctly. We are trying to do the best we can.

Member Nelson Ho says the legislature took away the contested case hearing and that the Working Group can make a recommendation.

Member Carlito Caliboso says that the Interim Report should focus on the issues directly related to SCR 99.

Member Ted Peck says since it is the Interim Report, we don't need all the answers.

Co-chair Ha asks if anyone has suggestions on how the report should go.

Member Carlito Caliboso reiterates that the report should only address the points expressed in SCR 99.

Member Ted Peck says the report can tell the legislators: here are the answers to these problems and here are the issues we need to track down. Also, the Executive Summary needs to be really tight.

Co-chair Ha invites the volunteer editor to the working group table to receive point-by-point instructions and edits of the report draft from the working group members. Appendices can

be used for bulk information and details referenced in text. Also, PDF files permit members to make comments on the text. A discussion of the executive summary ensues regarding key points and the possibilities of disagreements and unresolved issues. The members resolve to work on the Interim Report via email. There is a need to assess resources specifically. Need discussion of geothermal electricity potential, but also secondary industries, such as hydrogen and ammonia production. The scope of the resolution forms the basis of the contents of the report and the over-arching analysis of baseload feasibility. However, there is a need for context regarding peak oil and other considerations that provide the basis for the working group's recommendations to the legislators.

Member Nelson Ho states that the report should be lean and cut-to-the-chase rather than offer too much information. The information needs to be clearly stated. Since the environmental impact is site specific, there can be no information on the impact without identifying the location of the resource or how it will be developed.

Member Barry Mizuno agrees that the most critical issue should be to identify the resources available. More testing is needed.

Member Ted Peck points out the shortcomings of available data on geothermal. Report needs to discuss issues as well as upside.

Members Ted Peck and Nelson Ho discuss the pros and cons of mediation versus contested case hearing with the community members.

Co-chair Richard Ha discloses his discussions with a development group who are investigating the possibility of developing geothermal on Big Island. He has not joined with them and will keep the working group aware of his role, if any.

Members Nelson Ho and Barry Mizuno discuss the role of geothermal in the future and the need for geophysical data.

General discussion of format and structure of next draft using printout of existing draft among Working Group members and volunteer editor. The consensus is to build the report so that it is concise and focused on the SCR 99 mandates. Circulate the next draft in three sections: Executive Summary, Working Group writing assignments, and Appendices. Start with addressing using geothermal as primary energy resource as the Working Group conclusion and the additional uses (transportation and ammonia production) as secondary benefits.

Member Carlito Caliboso states that there may be a conflict if he supports geothermal uses before the legislation and is later asked to decide on geothermal development with the PUC.

Member Ted Peck states that even if members must recuse themselves from advocating for specific development, it is appropriate for the Working Group to assert its principal findings: that multiple geothermal plants are the most prudent approach, that historically geothermal is a lower-cost energy resource, it has the potential to supply baseload electricity, although it has not yet demonstrated baseload consistency in its application in Hawaii. It is a renewable resource indigenous to Big Island and can neutralize the price volatility of petroleum fuel for the county both in terms of the electrical grid and in terms of transportation. Additionally,

products that assist in island agriculture can be cost-effectively produced with geothermal and replace the importation of products made on the mainland from fossil fuels. Thus, it has a significant potential to be Big Island's primary energy resource.

Member Jay Ignacio advises that reliability is essential to satisfy the utility's need for dispatchable energy on demand.

Member Barry Mizuno suggests that if other geothermal plants were in operation and each one of three produced the mega wattage for the grid as well as electricity to create other products and services, than the combination of generation beyond the grid's requirements would permit reliability so that, if needed, one or more could serve in another's place.

Member Ted Peck states that a robust environmental impact statement can mitigate community concerns. A general discussion concludes that the contested case hearing be explored, but not recommended to the legislation at this time.

Member Jay Ignacio cannot speak to the intricacies of specific expansion of the HELCO grid, since that requires detailed study. However, he proposes a HELCO-funded, high-level study to look at a hypothetical expansion in two locations.

Member Ted Peck states that funding would be necessary to fully analyze the impact of a transition to geothermal. For example, shippers and dock workers may loose work importing supplies for petroleum-based plants. It is generally concurred that funding is needed and that the Working Group should recommend the legislation make it available.

Co-chair Wallace Ishibashi points out that there are two projects the Working Group recommends be funded: first, testing and identifying specific locations that hold promise to be geothermal generation sites and second, analyzing the impact of transition to geothermal upon the existing infrastructure. Resource analysis and impact assessment.

Community benefits discussion concerning the best approach and advisors to consult. Community benefits can include Volcanoes National Park hydrogen buses and agricultural fertilizer.

Member Robert Lindsey identifies the resources and people who will be supplying information for the community benefits section. Recommend to the legislation that royalties from geothermal be identified and ear-marked for local community benefits rather than going into the general fund.

Co-chair Wallace Ishibashi asks about royalties calculation and distribution. The legislation will have to address the percentage distribution when it comes up.

Member Barry Mizuno explains that the royalty is calculated according to the value of the resource using a formula developed by DNLR and the US Department of Interior; from that figure, 10 percent of the resource value is designated royalty.

Member Nelson Ho asks Richard Ha about IDG and the consortium who wants to develop geothermal.

Co-chair Richard Ha replies that the general idea seems good, but it is too early and nothing substantial has been done yet.

Meeting adjourned.

Appendix D

Activities to Date

Geothermal Working Group members attended monthly round-table discussions

Geothermal Working Group members prepared an Interim Report

Geothermal Working Group members toured HELCO power plant July 15, 2010

Geothermal Working Group members toured PGV power plant August 26, 2010

Richard Ha attended the **7th Annual NH3 Fuel Conference** in Detroit, MI Sept. 26–28, 2010

Richard Ha attended the **2010 ASPO-USA Peak Oil Conference**: The Future of Oil, Energy and the Economy in Washington, D.C. October 7-9, 2010

Energies **2009**, *2*, 25-47; Review **What is the Minimum EROI that a Sustainable Society Must Have?** by Charles A. S. Hall, Stephen Balogh and David J. R. Murphy

Wallace Forbes, 09,13,10; Review **Bracing For Peak Oil Production By Decade's End**, and interview with Charles Maxwell, senior energy analyst.

Review Platts News Service report by Leslie Moore, on the **ASPO Conference in Washington, DC - Peak Oil**

Analyze the latest material on emerging risk in the energy sector by **Lloyd's of London Insurance**; **360 Risk Insight**, a peer-reviewed White Paper by Antony Froggatt and Glada Lahn.

Co-chairs Wallace Ishibashi and Richard Ha participated in panel discussions in Kona and at the University of Hawaii, Hilo.

Co-chair Richard Ha participated with Kale and Robbie Alm and a Native Hawaii Legal Corp attorney on a geothermal panel at the Association of Hawaiian Civic Clubs in Kona.

Kanoe Wilson, University of Hawaii, Office of Student Affairs, First Nations' Futures Program Fellowship. Kamehameha Schools instituted program to improve management of First Nations' assets. Promote awareness through education of risks and rewards of developing geothermal; outreach which is still continuing.

Co-chair Richard Ha gave presentations to the Waimea and Keaukaha Community Associations, the Rotary Club of Waimea, and the Lions Club of Hilo.

Co-chair Wallace Ishibashi, Mike Kaleikini, Mililani Trask and co-chair Richard Ha appeared on Solar Radio. Richard Ha has been appeared on that program discussing geothermal three times.

Co-chair Wallace Ishibashi and co-chair Richard Ha gave presentations at the University of Hawaii, Hilo conference on Geothermal Energy May 28, 2011.

Co-chair Wallace Ishibashi and co-chair Richard Ha gave presentations at the Home-Grown Energy Forum, Saturday, August 27, 2011 at Hawaii County's Aupuni Center.

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at BILA Geo Committee,September 18, 2010

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Kona Community,Outrigger Keauhou, October 22, 2010

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Hilo UH, October 25, 2010

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at UCB 127 Hilo Moku Power, February 5, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Kona Community, February 8, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Puna Community IDG, April 8, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at BILA Labor, April 18, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Hilo Community, UH, May 28, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Oahu State Legislatures, July 7, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Maui Community, IDG, July 20, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Hilo Community, August 27, 2011

Co-chair Richard Ha gave a presentation at Waimea Community, IDG, September 21, 2011

Co-chair Wallace Ishibashi and co-chair Richard Ha gave a presentation at Kona Community, IDG, September 22, 2011

Appendix G

Energy Return On Investment by Dr. Charles A. S. Hall

Source: *energies* ISSN 1996-1073,
www.mdpi.com/journal/energies January 23, 2009

What is the Minimum EROI that a Sustainable Society Must Have?
Charles A. S. Hall, Stephen Balogh and David J. R. Murphy

Economic production and, more generally, most global societies, are overwhelmingly dependent upon depleting supplies of fossil fuels. There is considerable concern among resource scientists and many economists that decisions made about the future of energy, based on today's prices, could have dire consequences. The rise in petroleum prices between 2005 and 2008 that lead to the related market collapse of 2008 provided one indication of the short-comings of future predictions based on current market prices. A different method used to calculate the cost / benefit ratio of energy resources is: Energy Return On Investment (EROI). It provides a more rigorous approach to examining advantages and disadvantages of different fuels and also offers the possibility to look into the future in ways that markets seem unable to do. One important goal of the Geothermal Working Group Interim Report is to assess the minimum return-on-investment that must be attained from Hawaii's energy resources in order to support optimum social and economic activities. We surmise that for any system to survive, grow, and thrive, it must gain substantially more energy than it uses in obtaining that energy. Thus, Hawaii must abide by the principles that can be calculated using the Law of Minimum EROI for fossil fuel, which has been calculated at about 3 to 1 (the cost to drill, refine and deliver petroleum is three times greater than the benefit of use in farming, driving, producing electricity, etc.).

Today's prices are not influenced by tomorrow's conditions; the most abundant fuels will be less available -- for either geological (depletion) or political reasons -- in the future. In addition, current prices of energy in the U.S. are greatly influenced by various subsidies. The end of cheap oil might be, or soon might be, upon us. Meanwhile, gasoline prices, although high in nominal terms, just about peaked in 1981. Corrected for inflation, what we now pay for gasoline in a year is a smaller proportion of our income. Given that our island society is overwhelmingly dependent upon oil, this is cause for concern. The price at the pump or the price of a barrel today is a false indicator of true reserves and future market costs. Current conditions are an unreliable basis for projections and planning.

Net energy analysis is called the assessment of energy surplus, energy balance, or, energy return on investment (EROI). EROI is calculated from the following simple equation:

EROI = Energy returned to society vs. Energy required to get that energy

For most fuels, especially alternative fuels, the energy gains are reasonably well understood, but the boundaries of the denominator, especially with respect to community reaction and environmental issues, are poorly understood and even more poorly quantified. Survival, comfort, wealth, art and even civilization itself is a product of surplus energy. The ability of a given society to divert attention from life-sustaining needs, such as agriculture or the attainment of water, towards luxuries such as art and scholarship is based on the quantity and quality of surplus resources. Indeed, humans could not possibly have made it this far, or even from one generation to the next, without there being some kind of net positive energy.

Energy comes from many sources – from imported and domestic sources of oil, coal and natural gas, as well as hydropower and nuclear, and renewable energy – increasingly from wind, solar, geothermal, etc. Most of these are cheaper per unit energy delivered than oil. Globally, for every barrel of oil invested in seeking and producing more oil, some 20 barrels are delivered to society. Thus, fossil fuels still provide a very large energy surplus, obviously enough to run and expand the human population and the very large and complex industrial societies around the world.

That's the good news. The bad news is that the depletion of fossil fuels has been occurring since the first ton of coal or barrel of oil was mined. Since these fuels need about 100 million years to regenerate, depletion and technology are in a race. Either technology, the market and economic incentives will continue to find oil to replace that which we have extracted, or the prices will increase as oil reserves deplete and society must find substitutes when new technologies develop.

Furthermore, there is considerable evidence that, in the case of oil, we are mostly just pumping out old fields rather than replacing extracted oil with newly found oil. Globally, we are using between 2 to 3 barrels for each new barrel found. If current trends continue linearly, then in about two to three decades it will take one barrel of petroleum to find and produce one barrel of petroleum. Oil will cease to be a net source of energy. This means that the question is not necessarily what the size of global oil reserves is, but rather what is the size of that portion that is extractable with a positive net energy value? In the case of alternative resources the question is: at what rate can high EROI fuels can be produced. The implications of this are obvious, huge, and make an argument for seeking substitutes earlier rather than later. But, the problem with the alternatives is to find ones with the desirable traits of fossil fuels: 1) sufficient energy density 2) transportability 3) relatively low environmental impact per net unit delivered 4) relatively high EROI and 5) producible on a scale that society demands.

Economic Realities

At the time of this writing, a barrel of oil on the New York market is about $86. Assume that the *real price* of oil, that is, the price of oil relative to other goods and services, increased to $140 a barrel. If that happened, then $2.38 trillion, one fifth of the economy, would be used to buy the oil to run the other four fifths -- *not including* the energy-extraction system itself. If the price of oil increased to $250 per barrel, about one third of all economic activity would be required to run the other two thirds. At $750 a barrel, the output of the entire economy, $12 trillion dollars, would be required to generate the money to purchase the energy required to run the economy. There would be no net output. In a real economy there would be adjustments, alternative fuels and nuances. However, this analysis does give an overview of the relation between gross and net economic activity, as well as the vital role of energy. As the price of fuel increases, its EROI declines, and there are large impacts on the rest of the economy. These impacts can be especially influential because changes in the price of energy tend to impact discretionary, not base, spending.

Oil refineries use roughly 10 percent of the energy in fuel to refine it to the form that we use. In addition, about 17 percent of the material in a barrel of crude oil ends up as other petroleum products, not fuel. So for every 100 barrels coming into a refinery only about 73 barrels leaves as usable fuel. Natural gas does not need such extensive refining, although an unknown amount needs to be used to separate the gas into its various components and a great deal, perhaps as much as 25 percent, is lost through pipeline leaks and to maintain pipeline pressure. Coal is usually burned to make electricity at an average efficiency of 35 - 40 percent. What this means is that at least 1.27 units of crude oil are added to the cost to deliver 1 unit as a fuel.

Oil weighs roughly 0.136 tons per barrel; transportation by truck uses about 3400 BTU/ton-mile. Thus, it costs about 5% of the total energy content of a barrel of oil to move it to where it is used. Now the calculation for EROI changes to about 40 percent (17 percent non-fuel loss, plus 10 percent to run the refinery, plus 10 percent extraction, plus about 3 percent transportation loss). For oil one needs an EROI at the mine mouth of roughly 1.4 to get that energy to the point of final use.

What our society needs, however, is energy services, not energy itself, which has little intrinsic economic utility. So we must count in our equation not just the *upstream* energy cost of finding and producing the fuels themselves, but all of the *downstream* energy required to deliver the service (in this case transportation): 1) building and maintaining vehicles, 2) making and maintaining the roads used, 3) incorporating the depreciation of vehicles, 4) incorporating the cost of insurance, 5) etc. Our calculation, adding in the energy costs of getting the oil in the ground to the consumer in a usable from (40 percent) plus the pro-rated energy cost of the

infrastructure necessary to use the fuel (24 percent) is 64 percent of the initial oil in the ground. Thus, the energy necessary to provide the services of 1 unit of crude oil at the gas station or the electrical generator is roughly 3 units of crude oil. This cuts our EROI to 3:1 for a gallon at final use, since about two thirds of the energy extracted is necessary to do the other things required to get the service from burning that one gallon. Include the energy cost of supporting labor or compensating for environmental destruction and this ratio increases substantially. In the final analysis, even before factoring in the inefficiencies of transforming fossil fuel to electricity and delivering it to homes and businesses, the current method of electrical production is simply not sustainable.

Appendix H

Charles Maxwell, Senior Energy Analyst at Weeden and Company
Interviewed by Wallace Forbes

Maxwell: The use of petroleum in the world is now up to about 30 billion barrels per year. The rate at which we have found new supplies of petroleum over the last 10 years has fallen to an average of only about 10 billion barrels per year.

We're obviously in an unsustainable situation. We are now using up a greater number of barrels that we have found in the recent past and that we have reserved in the ground. We are now beginning to use it up relatively quickly--with scary consequences for the future.

The peak of production usually comes sometime between 30 and 50 years after the peak of finding oil. "The peak of discovery," as they call it. For instance, in the North Sea, the peak of discovery was in the late 1960s, and the peak of production was in the late 1990s. So it was around 30 years between the peak of finding oil and the peak production of that oil.

Forbes: From those sources in the North Sea?

Maxwell: Yes. In the United States, the actual peak of discovery was 1931, quite a bit earlier. We were the first country to actually peak in the world of oil production. Our peak of production came in late in 1970. So that was a 39-year transition from the peak of finding the oil to the peak of producing it.

Now the question remains in front of us, has the world peaked in its level of discovery and if so, how long will it take the world, if it has peaked, to reach the peak of oil output? I believe that the peak of discovery fell in the five-year interval between 1965 and 1970. So if you took it at, say, 1968, and then you added 50 years, you would get to 2018.

Forbes: Is technology reducing the time between finding and producing oil?

Maxwell: Technology is trying to give us the ability to produce more out of a giant field. In the early days we only produced about 25%. Today we're producing about 40% of the oil in place when a field is found. These numbers are gaining rather slowly now. What's happening is that the increase in the world's population and greater use of oil in transportation, particularly in the emerging countries, is working to lift oil demand, and that spurs us to drain a field more quickly, but not necessarily to get a higher proportion of oil out of it. So we have technology improving production capability, but actually taking the oil out faster rather than getting much more out. I cannot tell you whether we are lengthening the life of a field very much in these times. It's a slow process, at best.

Appendix I

Association for the Study of Peak Oil & Gas Conference
Washington, DC (Platts News Service) - Leslie Moore Mira

A panel of geologists and energy analysts debated Thursday the severity and timing of an anticipated oil crisis, with one saying during a Washington briefing that crude oil production has now peaked.

"The global rate of production of oil is peaking now,"said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin. "The size of accumulation [of oil] is not equated to the rate of production," he said. Frank Rusco, an energy director at the US Government Accountability Office, estimated some 45 years of "proven reserves," though current and future oil demand will stress supplies.

"Higher oil prices can retard economic growth and even cause a recession in the right circumstance," Rusco said at the briefing, which was organized by the Association for the Study of Peak Oil and Gas. He declined to say after the briefing what a gasoline price ceiling might be for US consumers.
"The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," Rusco said, citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper." Meanwhile, "mitigation of oil dependency by transitioning into other energy sources will take upward of a decade to come into play. "Sometime after a decade, mitigation will take impact and things will start to flatten out," Hirsch said.

New reserves from Brazil and production from unconventional sources in the US will not be enough to compensate for depleting reserves, panelists said. The Ghawar oil field in Saudi Arabia, still a bright light in the petroleum world, could see a sharp and imminent decline in production, Patzek said. If Ghawar "peters out, to replace it [with production elsewhere] will be a very difficult task," he added. He estimated Ghawar's current production at between 4.5 million and 5 million barrels per day, though added that actual production figures are unknown as they are a "top secret."

Later, on the sidelines, Patzek said Ghawar could become the region's Cantarell, referring to Mexico's offshore oil field that has seen production plummet by over half from a peak 2.1 million barrels per day in the mid-2000s. Patzek said that the ongoing water-flood efforts into the

Ghawar field to stimulate production will eventually taper off. "You're injecting twice as much water into the well," he said. "Your field is watering out," Patzek said in an interview Patzek told the briefing that Norway's reserves have peaked, while he characterized the decline rate in the US Gulf of Mexico as "very high." BP's Thunder Horse well in the Gulf "has not reached its potential and it's declining faster than people thought," Patzek said. A BP spokesman was not immediately available for comment on Patzek's remarks about Thunder Horse.

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference. "This is not a recovery that we're in," said Nicole Foss, a former fellow at the Oxford Institute for Energy Studies, who predicted "chaos" in foreign currency and equity markets within years. A severe deflationary plunge will contribute to a liquidity crisis among the financial sector, Foss said on a peak oil panel late last week. The meeting in Washington wrapped up Saturday.

"Oil will bottom early in this depression," Foss said. She and fellow panelist, energy analyst, Chris Martenson, predicted that foreign currency markets will become more volatile, with domino effects on global money supply. "It's not unthinkable the the US will have another financial crisis," Martenson said, adding that he gave the US a "50%" shot at having a fiscal crisis and a "50%" chance of experiencing a currency crisis. "We're going to see severe dislocations in the foreign exchange markets."

Deflation is tomorrow's problem," Foss said, adding that a lack of purchasing power will undermine price support for crude oil. Then "printing [money] is a few years off," she said. "We could see $20 per barrel and then $500 per barrel within the space of five years," Foss said. Foss runs the Agri-Energy Producers' Association of Ontario, where she has focused on farm-based biogas projects and grid connections for renewable energy. At Oxford, she researched electricity policy at the EU level, according to her website. She was previously editor of the Oil Drum Canada, where she wrote about peak oil and finance.

Speaking on the sidelines of the conference, Foss said that natural gas holds no promise as a safe hydrocarbon haven in a scenario of volatile crude oil prices. There is a "perception of a glut" of natural gas reserves and other resources from new shale plays and coal-bed methane and tight formation gas Foss said. "I would argue that this is an illusion," Foss said. The environmental cost of extracting unconventional resources "is tremendous," Foss said, adding that the energy resource "bang for buck" is unappealing. "We'll end up with natural gas price spikes, "after years of low natural gas prices," she said.

Appendix J

Strategic Risks and Opportunities for Business
Lloyd's of London White Paper

The Energy, Environment and Development Program (EEDP) at Chatham House advances the international debate on energy, environment, resources and development policy.

Author, Antony Froggatt, is a Senior Research Fellow at Chatham House. He has worked on international energy and climate issues for over 20 years.

Co-author, Glada Lahn, is a Research Fellow specializing in energy governance and development issues. She has published papers on Asian energy and is researching energy policy in the Gulf.

Overview

Independently of what happens in UN negotiating rooms, the US Congress, or multi-national corporate board rooms, Hawaii's legislature and Hawaii's businesses can take action. We can plan our energy needs, we can make every effort to reduce consumption, and we can aim for a mix of different energy sources. The transformation of the energy environment from carbon to clean energy sources creates an extraordinary challenge for our island. We can expect dramatic changes: prices are likely to rise, with some commentators suggesting oil may reach $200 a barrel; regulations on carbon emissions will intensify; and reputations will be won or lost as the public demands that big energy users and suppliers reduce their environmental footprint.

1. Energy security and environmental concerns are unleashing a wave of policy initiatives and investments that will fundamentally alter the way that we manage and use energy.

2. Modern society has been built on the back of access to relatively cheap, combustible, carbon-based energy sources. Three factors render that model outdated: surging energy consumption in emerging economies, multiple constraints on conventional fuel production and international recognition that continuing to release carbon dioxide into the atmosphere will cause climate chaos.

3. China and emerging Asian economies have already demonstrated their weight in the energy markets. Their importance in global energy security will grow.

4. Energy markets will continue to be volatile as traditional mechanisms for balancing supply and price lose their power. International oil prices are likely to rise in the short to mid-term due

to the costs of producing additional barrels from difficult environments, such as deep offshore fields and tar sands.

5. Much of the world's energy infrastructure lies in areas that will be increasingly subject to severe weather. On top of this, extraction is increasingly taking place in more severe environments such as the Arctic and ultra-deep water. For energy users, it means greater likelihood of loss of power for industry and fuel supply disruptions.

6. Without an international agreement on the way forward on climate change mitigation, energy transitions will take place at different rates in different regions. Those who succeed in implementing the most efficient, low-carbon, cost-effective energy systems are likely to influence others and export their skills and technology.

7. The introduction of carbon pricing and cap and trade schemes will make the unit costs of energy more expensive. The most cost-effective mitigation strategy is to reduce fossil fuel energy consumption.

8. Businesses must address the impact of energy and carbon constraints holistically, and throughout their supply chains. Tight profit margins on food products, for example, will make some current sources unprofitable as the price of fuel rises and local suppliers become more competitive. Retail industries will need to either re-evaluate the 'just-in-time' business model which assumes a ready supply of energy throughout the supply chain.

9. The last few years have witnessed unprecedented investment in renewable energy and many countries are planning or piloting 'smart grids'. This revolution presents huge opportunities for new partnerships between energy suppliers, manufacturers and users.

Introduction

This report looks at short-term (one to five years) and medium-term (five to ten years) risks to general business. It also considers longer-term (ten years plus) issues, particularly as they impact on technological and investment choices for the energy sector. While energy supply disruption is frequently the result of technical faults and strike action, we do not deal with this here, but concentrate instead on the impacts of constraints on carbon and carbon-based resources.

Historically, energy security has meant defending against supply disruption and price instability. Within this mindset, protecting the status quo is paramount. Yet dynamic trends, including the sharp rise in demand from newly industrializing economies, carbon-dioxide induced global warming and the growth of alternative energy technologies, mean that protecting traditional

energy practices will make us *less secure*, and *less competitive*, in the future. This is in addition to the threat that climate change poses to energy infrastructure. These are not issues for the energy sector alone. The return to high and volatile oil prices after 2005 reinforced the link between energy prices, profits and economic stability for most businesses.

Renewable energy has moved into the mainstream and is now supplying the majority of new electricity in some regions. To increase efficiency and allow the uptake of more renewable energy, radically different infrastructures are being planned around the world. These may include local and trans-national 'smart grids' that communicate with household and industrial appliances and electric vehicles, and can send power back into the grid to help regulate demand flows.

There is little sign that energy demand will go down, with forecasts suggesting a 40% increase by 2030. This will require $26 trillion of investment - some 1.4% of global GDP. Given the global commitment to radically reduce emissions and the finite nature of conventional fossil fuel sources, a rapid movement towards a highly-efficient non-fossil energy future would seem to be the logical investment choice.

Trends

With world population growth and pressure for higher standards of living in developing countries, demand for energy will reach new heights. But how long can we rely on these ultimately exhaustible and, with the exception of uranium, C02 emitting fuels? There is now widespread acknowledgement that we are in a 'transition' period heading towards less-polluting, more-sustainable forms of energy. This involves scaling up new technologies and introducing completely different energy delivery systems.

Energy is a globalized commodity. Sudden demand pressures for certain fuels in one place, coupled with previous inadequate investment in the necessary resources elsewhere, will push up prices on the international markets. Before new models of international energy governance are developed, insecurity will encourage strategic investments by the most import-dependent countries. Together with policies to reduce subsidies and increase efficiency, these trends will drive up final consumer prices for transport, fuel, heat and electricity in the short to mid term.

Advanced economies remain the biggest consumers of primary energy per person but by 2008 non-OECD countries, led by China and India, had outstripped them in terms of the share of world demand. These consumption trajectories mean there is likely to be a tipping point in 2015 when countries in Asia-Pacific need more imported oil in total than the Middle East (including Sudan) can export.

In spite of high CO2 emissions per unit of energy (two to three times more CO2 than natural gas when burned in conventional thermal power plants), coal is the fastest growing fossil fuel. Many countries plan to increase the share of natural gas in their national energy mixes as it has lower emissions than coal and oil and is more versatile It can replace coal as a fuel for electricity generation and oil-based transport fuels in gas-to-liquid and compressed forms.

In the developing world, increasing car ownership and subsidized fuel prices will continue to drive up oil demand in the next few years. Whereas fuel-efficiency standards, taxed fuel prices and alternatives, including biofuels, reduce demand in the advanced economies. Peak oil demand (the suggestion that reductions in demand as a result of policy, technology and behavioral changes will occur before any geological driven change) is a distinct possibility in the longer term. Unsustainable consumption trends are forcing many countries, particularly oil exporters, to rethink their energy pricing and subsidy systems to encourage greater efficiency.

Peak Oil

A vast array of studies have attempted to predict the time at which global oil production will reach a maximum level, from which point it will go into irrevocable decline. Some suggest that this 'peak' has already occurred, while others maintain it is either impossible to predict or shows no sign of appearing. Looking further than a decade into the future presents many uncertainties, including: the availability and cost of extraction technologies; substitute technologies; pricing systems in major economies; and carbon legislation. A peak in conventional oil production before 2030 appears likely, and there is a significant risk of a peak before 2020. With average rates of decline from current fields, the report says that just to maintain current production levels would require the equivalent of a new Saudi Arabia coming on-stream every three years. What's more, giant fields pass peak production levels and there is a shift to smaller, more difficult to produce fields that have faster depletion rates meaning the rate of decline will accelerate. Even before we reach peak oil, we could witness an oil supply crunch because of increased Asian demand.

Unconventional oil, including very heavy oil, oil sands, and tar sands (bitumen), has a high viscosity. It flows very slowly and requires processing or dilution to be extracted through a well bore. Very heavy oil in Venezuela, oil sands in Canada, and oil shale in the US account for more than 80% of unconventional resources.

While some oil companies have invested large amounts in non-conventional oil, there are a number of limiting factors, including: environmental impacts; capital and operating costs; and the energy balance of the whole operation (how much energy is required to extract, process and transport the fuel compared to the final product).

The costs, environmental impact and security implications of these options differ and are at the center of fierce debates about the trade-offs between climate and energy security. For example, CO2 emissions from oil sands are at least 20% higher than for oil currently consumed in the US. This is because the energy input (usually in gas) needed to get the oil out is around three times as much as for conventional oil. It also takes three barrels of water to produce each barrel of oil, most of that being too toxic to return to the rivers. Emissions from shale oil are likely to be higher and those from coal to liquids are at least double the levels of those from conventional oil-based fuel. Gas to liquids would produce emissions some 10% to 15% higher than those from conventional gasoline or diesel.

Over a quarter of US oil production and close to 15% of US natural gas production comes from the Gulf of Mexico. In the summer of 2005, Hurricane Katrina shut off what amounted to around 19% of US refining capacity, damaged 457 pipelines and destroyed 113 platforms. Oil and gas production dropped by more than half; causing a global spike in oil prices. Much of the infrastructure destroyed in 2005 was rebuilt in the same location, leaving it vulnerable to similar weather events in the future.

The US Geological Survey estimates that the Arctic might contain over a fifth of all undiscovered oil and gas reserves. Siberia could contain as much oil as the Middle East. However, dreams of a resource bonanza in the north are premature. The environment is difficult and becoming increasingly unpredictable as a result of the changing climate. The thawing of permafrost in the north is already causing infrastructural damage and reportedly costing Russia around $1.9 billion a year to repair infrastructure and oil and gas pipelines in West Siberia.

Renewable Energy

There are a large variety of sources of renewable energies that are available in different concentrations all over the world. These include:

- Heating and cooling: passive solar architecture; solar thermal collectors; biomass-based combined heat and power; and geothermal energy.
- Electricity: solar photo-voltaic; solar thermal; hydro; solid biomass; biogas; geothermal; on and offshore wind; marine energies like sea current, wave and tidal energies.
- Transport (internal combustion-based): bioethanol; biomethanol; oils from biomass; and biomass-based synthetic fuels.

Until the last decade, the commercial renewable energy field was dominated by hydropower for electricity, biomass for heating, and solar thermal for hot water. However, the commercial strength of onshore wind has led to unprecedented growth in this area in a number of regions. This trend is likely to continue, as will the development of solar power for electricity production. The use of biofuels as a transport fuel remains controversial, due to the impact on food prices, land use and water consumption. If the use of biofuels is to be expanded, it is likely to require rapid technology innovation and the use of non-food sources for fuel, such as algae.

The most common critique of wind and solar power is that they both rely on intermittent sources. This means that thermal or nuclear capacity is still needed as back-up to compensate for times when the wind doesn't blow or the sun doesn't shine.

The growth of the current generation of biofuels is expected to slow due to environmental concerns and the impact of such large-scale production on land use and food prices. These concerns have accelerated the development of the next generation of biofuels, which will no longer use potential food sources for the production of ethanol (such as wheat), but farm waste instead. These could become more widespread in the next couple of years. Commercially viable third-generation biofuels from specially farmed plant forms, such as algae, are still at the research stage.

Water flows are fundamental for agriculture, power generation and cooling. Hydropower contributes around 15% of global electricity production, by far the largest of any renewable energy. It relies on the ability to predict the volume of water entering the system. Before construction, care is taken to assess river levels, hydrological cycles and precipitation patterns. Until recently those findings were considered to be constants. However, climate change is expected to cause accelerated changes in the rainfall patterns and what were constants are now becoming variables. This can cause problems for both glacier-dependent and precipitation-dependent power plants.

Challenges and Risks

In spite of broad international agreement on the importance of inventing and deploying technologies to meet energy and climate security goals, progress has been slow. Uncertainties around domestic and international regulations and pricing structures can stall investment, discourage collaborative projects and generally dampen investor confidence. For example, inconsistent policies have entrenched a pattern of boom and bust in the renewable energy and efficiency industries in many parts of the world, including the US.

Over a quarter of US oil production and close to 15% of US natural gas production comes from the Gulf of Mexico. In the summer of 2005, Hurricane Katrina shut off what amounted to around 19% of US refining capacity, damaged 457 pipelines and destroyed 113 platforms. Oil and gas production dropped by more than half; causing a global spike in oil prices. Much of the infrastructure destroyed in 2005 was rebuilt in the same location, leaving it vulnerable to similar weather events in the future.

All of the world's largest energy importers are dependent on sea imported oil. The US imports 60% of the oil it consumes (over 95% delivered by tankers) while the growing markets of China and India import 90% by sea. Japan is almost completely dependent on maritime oil imports. The traffic is increasing as countries require greater energy imports further from their markets.

Key challenges that will affect businesses across the board are:

- Cost and stability of services
- Pressure to reduce carbon emissions
- The transformative changes in the energy sector
- Price and supply
- Regulatory considerations: counting the cost of carbon
- The food industry could be affected by energy disruption - supermarkets tend to keep only a few days worth of perishables on their shelves
- Environmental risks
- Investment risks
- Technology risks
- Operational risks - Infrastructure and systems *not built* to withstand changing environmental conditions will require expensive retrofitting
- With energy production forecast to grow by approximately 45% over the next two decades, water consumption for energy production will more than double over the same period
- Operating in more difficult terrains increases the risk of accidents which have human, environmental and economic consequences.

Conclusion

Energy security is now inseparable from the transition to a low-carbon economy.

Traditional fossil-fuel resources face serious supply constraints and an oil supply crunch is likely in the short-to-medium term.

Of particular importance for new technologies is the risk of constraints on raw materials such as rare earth metals, as scarcity may drive up costs.

Energy infrastructure will be increasingly vulnerable to unanticipated severe weather leading to a greater frequency of brownouts and supply disruptions.

Increasing energy costs as a result of reduced availability, higher global demand and carbon pricing are best tackled in the short term by changes in practices.

The sooner that businesses reassess global supply chains and just-in-time models, and increase the resilience of their logistics against energy supply disruptions, the better.

While the vast majority of investment in the energy transition will come from the private sector, governments have an important role in delivering policies and measures that create the necessary investment conditions and incentives.

Appendix K

Geothermal Development in Hawaii

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Geothermal resources

The Hawaiian Islands lie above a geological "hot spot" in the earth's mantle that has been volcanically active for the past 70 million years, with the island of Hawaii (Big Island) having the most recent activity. The Big Island has an obvious, large potential for geothermal energy resources, both for electrical generation and direct utilization. Since the 1976 drilling of the HGP-A well and the discovery of the Kapoho Geothermal Reservoir in the lower Kilauea East Rift Zone, geothermal power potential on the Big Island has been estimated at between 500 and 700 Megawatts.

Geothermal interest was motivated by the fact that imported oil is used to supply over 90 percent of Hawaii's energy needs. No other state in the U.S. is so critically dependent on imported oil; geothermal was regarded as a renewable source to help make the islands less dependent on imported energy.

The Hawaii Geothermal Resources Assessment Program was initiated in 1978. The preliminary phase of this effort identified 20 Potential Geothermal Resource Areas (PGRAs) using available geological, geochemical and geophysical data.

The second phase of the Assessment Program undertook a series of field studies, utilizing a variety of geothermal exploration techniques, in an effort to confirm the presence of thermal anomalies in the identified PGRAs and, if confirmed, also more completely characterize them.

The island of Oahu, the major population center of Hawaii, is the second oldest major island and was formed from two independent volcanic systems. A preliminary assessment identified six locations where data suggested that a thermal resource might be present. The present assessment of the geothermal potential for Lualualei Valley is that there is a 10 to 20 percent probability of a low-to-moderate temperature resource existing at depths of less than 3 km. The probability of the existence of a moderate-to-high temperature thermal resource within 3 km is less than 5%.

The island of Hawaii, is the youngest and the largest island in the Hawaiian. A number of potential geothermal resources were identified in the preliminary assessment.

- Kilauea East Rift Zone was designated as a Known Geothermal Resource Area due to a productive geothermal well. The probability of a geothermal resource in this area is 100%.
- Kilauea Southwest Rift Zone and has a geothermal resource probability of 100% for a low-to-moderate resource and 70 to 80% for a moderate-to-high resource.
- Mauna Loa area did not exhibit any significant indications of a geothermal resource: less than 5% for a low-temperature resource.
- Kawaihae area is 35 to 45% low-to-moderate resource and less than 15% moderate-to-high.
- Hualalai summit indicated 35 to 45% low-to-moderate resource and 20 to 30% moderate-to-high.

An experimental 3 MW power plant went online in 1982; which, when it was shut down after eight years of production, had an availability factor of 95%. The plant was originally designed as a two-year demonstration project and incorporated several unique characteristics. Because the facility was located in the Kilauea East Rift Zone and therefore, was in a high lava-hazard zone, the turbine-generator set was built on skids, and the building housing the turbine-generator had a bridge crane capable of lifting the turbine-generator unit, so that it could be quickly removed in the event of a lava flow. In addition, the well was housed in a concrete bunker that could be completely enclosed with a set of covers, to allow a lava flow to cover the site without damaging the wellhead. Over the life of the plant, the generator facility produced between 15 and 19 million kilowatt-hours of electricity per year. In 1986 the HGP-A facility was transferred from U.S. Department of Energy ownership to the state of Hawaii and assigned to the Natural Energy Laboratory of Hawaii.

In 1985, the Noi'i O Puna (Puna Geothermal Research Center) was established to support direct use of the waste heat from the brines of the HGP-A well. The Community Geothermal Technology Program (CGTP) was conceived in 1986. The purpose of the program was to support small business enterprises in the Puna District, encourage the use of waste heat and byproducts from HGP-A, and to allow access to the geothermal resource.

The HGP-A power plant was closed in late 1989 on the order of Governor John Waihee and County of Hawaii Planning Director Duane Kanuha. The closure of the power plant was permanent due to the fact that it was no longer accomplishing it's primary goal of demonstrating the benefits of geothermal power. Although the facility was designed for only a two-year demonstration life, it has been operated for nearly eight years. During the interval, inadequate maintenance had taken a severe toll on the reliability and effectiveness of the equipment, and the costs of operation exceeded the revenues being generated. In addition, the effluent abatement systems and the brine disposal processes were neither efficient nor acceptable to the community or the regulatory agencies.

Despite the difficulties that were encountered, the facility accomplished a great deal. It demonstrated that the resource in the Kilauea Lower East Rift Zone was robust: the decline in production from the HGP-A well, over the eight year life of the plant, was only a few percent per year. The facility demonstrated that the reservoir fluids required special handling and maintenance, but also demonstrated that fluid chemistry issues could be managed. Some of the techniques for fluid handling and disposal that were developed and tested at the HGP-A facility were employed by the subsequent commercial power plant and proved key to disposal of their waste fluids.

And, finally, the operations, and missteps, taken at the HGP-A facility, served to sensitize Hawaii's regulatory agencies to issues regarding geothermal development that affect the community. It should also be noted that, with the closure of the power generation activities at the HGP-A, the Community Geothermal Technology Program also was terminated due to loss of the waste heat produced by the generation process

Geothermal / Inter-Island Transmission Project

From 1982 through early 1990, an engineering feasibility project was undertaken to evaluate the technical and economic challenges of installing a large-scale 500-megawatt geothermal/inter-island submarine cable. About $26 million (Federal and State funding) was expended in studies, design, engineering, fabrication, and testing for the Hawaii Deep Water Cable Project. The design criteria stated that the cable would have to withstand the stresses of at-sea deployment (including strong currents, large waves, and strong winds), the undersea environment (including corrosion and abrasion), and be able to reliably conduct electricity for thirty years. Since the Alenuihaha Channel is nearly 2,000 meters deep, both deployment (laying of the cables) and operating environment posed exceptional engineering challenges. The rationale for the project was that the primary source of geothermal energy was on the island of Hawaii, and the major electrical load was on the island of Oahu, where Honolulu is located. The scheme under consideration was to use the geothermal energy to generate power and transmit it to Oahu. At the time it was estimated that up to 500 MW could be used on Oahu, whereas only about 100 MW were needed on the Big Island.

The electricity produced by the project could potentially represent a large portion of the electric power supply for Oahu. Thus, the project would have to provide a reliable supply of electricity. The amount of energy that HECO (Hawaiian Electric Company) would purchase would be dependent on HECO's assessment of the reliability of the project and the availability of the electricity.

Puna Geothermal Venture Power Plant

In 1990, the Puna Geothermal Venture Facility, situated on 25 acres of a 500-acre plot, located 21 miles south of Hilo on the Big Island, replaced the HPG-A facility. This facility is in the geologic region known as the Lower East Rift Zone. Puna Geothermal Venture is the first commercial geothermal power plant in the state of Hawaii and currently is capable of producing about 30 MW of power. The power plant comprises 10 combined cycle ORMAT Energy Convertors (OECs) installed in parallel. Each OEC consists of a Level I topping steam turbine and a Level II organic turbine connected to a common generator.

Puna Geothermal Venture provides nearly a quarter of the power consumed on the Island of Hawaii. That is enough electricity to meet the needs of more than 25,000 residents and visitors. As of April 2002, the power plant has produced a total of 1.9 billion kWh, and displaced a total of 552 tons of oil.

In 2000, Puna Geothermal Venture announced its intention of doubling its electrical generation capacity from 30 MW to 60 MW. The wells supply geothermal steam at high pressure which must be reduced with valves before the steam goes through the generators. Puna Geothermal Venture plans to place an 8 MW generator at the well to reduce pressure to the other generators while producing power. In the long run, the company can increase capacity to 50 MW without any new wells.

In 2001, Puna Geothermal Venture was chosen to operate the Puna Geothermal Research Center (Noi'i O Puna) facility by the Natural Energy Laboratory of Hawaii Authority. Puna Geothermal Venture proposed continued power production while also developing new production capabilities without drilling new wells. They plan to solicit proposals from entrepreneurs and sell them geothermal energy. PGV will refurbish and expand the visitor center and will also make reasonable efforts to solicit proposals from the public for the development, construction, operation and maintenance of a geothermal heat source on the property. PGV will market facilities to transfer surplus heat from their geothermal facility and within the Noi'i O Puna facility for geothermal related businesses of local entrepreneurs.

Regulation Impediments

The regulatory regime seems to be quite complex. There is the Geothermal Resource Subzone (GRS) Assessment and Designation Law (Act 296, SLH 1983), the Hawaii County Planning Commission's Rule 12, and Act 301, SLH 1988 just to name a few.

The Geothermal Resource Subzone Law stated that the exploration and development of Hawaii's geothermal resources are of statewide benefit and this interest must be balanced with preserving Hawaii's unique social and natural environment.

Three Geothermal Resource Subzones were designated by the Board of Land and Natural Resources after evaluating a number of factors including social and environmental impacts. The subzones total 22,300 acres in the middle and lower Kilauea Rift Zone and 4,000 acres in the Haleakala Southwest Rift Zone.

Public-Acceptance Hurdles

The development of geothermal energy in the Kilauea East Rift Zone has stirred a significant amount of controversy. The experimental HGP-A power plant was not perceived as a "good neighbor" due to emission releases, the extent of brine ponds beyond the plant boundaries, and an unkempt appearance of the plant itself because of limited maintenance. Further exploration was opposed, often vehemently, by people expressing concern over various issues, including impacts on Hawaiian cultural and religious values, potential geologic hazards, public health, and loss of native rainforest, as well as changing the rural nature of Puna. During the establishment of the Puna Geothermal Venture plant, an episode of planned open venting and a number of uncontrolled steam releases stimulated the evacuation of some nearby residents and enhanced fears that the resource could not be safely tapped.

Since the PGV plant has been operating for a decade, most Hawaii residents have accepted it as part of the power supply. However, there is continued concern about health and environmental issues among some residents near the plant which have resulted in investigations by the US Environmental Protection Agency and a program documenting residents' health problems, which they attribute to geothermal emissions. The relationship between PGV and its neighbors appears to have improved with better communication between the company and the adjacent residents.

Among the issues which have concerned geothermal opponents are:

- Interference with worship of the Goddess Pele
- Interference with certain Native Hawaiian practices Rainforest destruction
- Possible health and safety impacts
- Disruption of the way of life for nearby residents
- Hydrogen sulfide and other air quality issues
- Noise
- Increased strain on an inadequate infrastructure
- Impact on native fauna and flora

Opposition Issues

According to state regulations, the exploration and development of geothermal resources can be permitted within conservation, agricultural, rural, and urban areas. The vast majority of resources are located in predominantly rural areas and in some cases, geothermal resources may be present in more primitive tracts where direct human impacts or occupation are minimal such as the Wao Kele O Puna rainforest. In the former case, many of the residents of these rural areas moved there to escape urbanization and industrialization of more populous counties of states (e.g., Honolulu, California), and the implementation of an industrial activity–the generation of geothermal power–was completely contrary to their lifestyle. In the latter situation, the installation of power production facilities in the rainforest–even one degraded by invasive exotic/non-native plants and animals–was equally offensive to other interest groups in the state.

An uncontrolled venting incident in June 1991 at the Puna Geothermal Venture project on the Big Island released hydrogen sulfide and other gases, and gave ample validation to the concerns of the area residents regarding the adverse impacts of this development on their communities. As a result of the "blowout," a Geothermal Management Plan was developed that has enabled state and county agencies to better regulate geothermal activity and enforce permit conditions.

Nonetheless, geothermal wells are sometimes vented intentionally for a few hours to clear the well and pipelines resulting in a temporary release of steam and abated gases. These events can be noisy for a short time and, in addition, the power plant equipment (e.g., cooling tower fans, pumps, etc.) do emit continuous low-level noise during normal power plant operations. Hence, some impact on the community from power production is inescapable; it serves as a continuous irritation to those who feel that their environment has been invaded by industrialization.

A more intangible objection was also raised by some native Hawaiians who claimed that the development of geothermal power was interfering with their worship of Pele, the Goddess of volcanoes. These objections were taken as far as the U.S. Supreme Court, who found that geothermal development does not interfere with religious freedom.

The disputes over the development of a geothermal industry in Hawaii culminated in several actions by the state and the geothermal opponents that effectively ended any serious effort to develop any significant geothermal production capacity on the island of Hawaii, or in the state at all.

In 1991, there were two entities actively pursuing development of the geothermal resource on the Kilauea East Rift Zone: Puna Geothermal Venture on the lower rift, and True Geothermal Energy

Company in the middle rift area. The former was in the process of constructing their power plant and proving up their resource; whereas, the latter, having spent about 10 years struggling with the regulatory environment, was in the process of drilling the first of their exploration wells. When Puna Geothermal Venture lost control of one of their wells during drilling and allowed the uncontrolled release of steam from their exploration well, the state regulatory agencies suspended–indefinitely–the geothermal drilling permits of both Puna Geothermal Venture as well as the True Geothermal Energy Company. The latter company interpreted the loss of their permits–even though they were in compliance with their permit conditions–as an indication of waning political support for geothermal development by the state political powers. This loss of support, as well as less than hoped-for success in their exploratory drilling, ultimately led to their abandonment of further efforts to develop their project on the middle rift subzone.

The second event that further eroded momentum for the geothermal program resulted from an effort by the state to obtain additional federal support for the combined geothermal/inter-island cable program. In this effort, the state presented all of the state- and federally-sponsored research, development, and demonstration activities up to that date as a single unified program designed to lay the foundation for large-scale, 500-megawatt-development of Hawaii's geothermal resources. Although this strategy was intended to rationalize significant, additional federal investment in the RD&D effort, it had unexpected and adverse consequences.

Soon after the state presented the program as a unified effort, the Sierra Club Legal Defense Fund brought suit against the state and the U.S. Department of Energy in an effort to force the relevant agencies to conduct a Federal Environmental Impact Statement on the full 500-MWe development. The U.S. DOE expended -$5 million in an effort to conduct an EIS, but made minimal progress in meeting the demands of the geothermal opponents. Ultimately, the state and DOE settled with the plaintiffs in the suit by signing a "consent decree" that effectively barred the Hawaii governor–for the duration of his term in office–from providing support to any program that would further the state's objective of developing large-scale geothermal power production or transmission inter-island. The state's capitulation to the demands of the opponents, as well as a declining real cost of petroleum for electrical power production, effectively ended any serious effort to develop geothermal power generation beyond that of the Puna Geothermal Venture efforts on the lower east rift zone.

Nearly a decade has passed since many of these events occurred. Puna Geothermal Venture was, however, able to bring a 35-megawatt power plant online–after many delays and much greater costs than had been anticipated by their original investors. Although technical challenges remain a significant concern in the operation of this facility, it has managed to produce power with a minimum of steam releases into the community and a minimum of public controversy.

And the company has been able to obtain permits to expand their production to 60 MWe. However, there are no current plans to expand their production capacity, and there is little serious discussion given to significant expansion of geothermal capacity either on the island of Hawaii or elsewhere in the state. Undoubtedly, this situation is the result of the currently low cost of petroleum–in "real" dollars–but is also in recognition of the severe regulatory and political risks any new investment in significant geothermal production capacity would face in Hawaii today.

Renewable Portfolio Standard

A Renewable Portfolio Standard (RPS) is a policy to encourage the use of renewable energy sources. It sets minimum targets for the production of electricity generated from renewable resources. The aim is to ensure deployment of renewable energy to enjoy the benefits of reduced energy costs, reduced exposure to the economic effects of volatile oil markets, risk management by diversifying generation options, job creation and economic benefits, and environmental benefits.

The state of Hawaii has an extremely high dependence on imported fuels for energy; 90% of the energy supplies are imported oil and coal. Therefore, increased use of renewable energy would achieve increased energy security, reduce some of the environmental risks associated with fuel transport, and reduce the flow of money out of the state. The cost of electricity in Hawaii is the highest of any state in the United States with average price per kWh in September 2000 of $0.144 -- that's over twice the U.S. average price per kWh of $0.0691.

Not only were Hawaii's electricity prices per kWh the highest in the nation in October 2000, electricity revenues per kWh for Hawaii utilities grew much faster than the U.S. average over the years since 1990. Hawaii's revenues per kWh were 59.6% higher than the average for 1990 while the U.S. average was only 3.3% higher. For comparison, Honolulu consumer prices increased about 25.5% from 1990 to 1999.

Electric utilities in Hawaii are "regulated monopolies" meaning they are allowed to operate without competition, but must follow rules set by the Public Utilities Commission. By adopting a renewable portfolio standard, the use of renewable energy becomes one of those rules.

Hawaii's dependence on fossil fuels is expected to grow over the coming decade unless action is taken to increase the use of renewable energy. In 1999, Hawaii's four electric utilities sold 9,373.8 Gigawatt hours (GWh) of electricity. Statewide, utilities forecast that electricity sales will grow at an average annual rate of 1.6% during the 1999 through 2010 period, reaching approximately 11,192 GWh in 2010.

In 1999, renewable energy (geothermal, municipal solid waste, bagasse, landfill methane gas, hydro and wind) was used to produce 7.2% of the electricity generated for sale by the four electric utilities. Renewable energy generation capacity was reduced in 2000 by the closure of Lihue Plantation on Kauai and Pioneer and Paia Mills on Maui. If the remaining renewable energy resources in operation at the end of 2000 continue in operation through 2010, they will provide an estimated 642 GWh of sales during each year of the period. This will amount to approximately 6.6% of total electricity sales in 2001. As electricity demand grows, the percentage of electricity sales from renewable resources will decline to approximately 5.7% statewide by 2010.

Hawaii has an abundance of renewable energy resources. Several studies have shown that at least 10.5% of Hawaii's electricity could be generated from renewable resources by 2010 with no increase in cost to Hawaii's residents.

Increased use of renewable energy sources through the implementation of a RPS can result in many benefits to Hawaii including:

- Reduced cost of fuel for electricity generation
- Reduced reliance on imported oil supplies and exposure to oil market prices
- Risk management by diversifying the portfolio of electricity generation options
- Job creation and economic benefits
- Environmental benefits

Conclusion

There is still resistance to using geothermal energy by some members of the local community, even though the issues noted above have been -- and continue to be -- addressed by government and PGV. However, there are well organized groups (such as the Pele Defense Fund, Rain Forest Action Network and other community organizations) that continue to express concern about the abilities of government and developers to provide socially and environmentally sound geothermal power. Furthermore, the level of support given by the state's political establishment to expansion of geothermal capacity remains vanishingly small. There is presently only funding for one geothermal staff person at the state level.

Appendix L

Warranty Deed and Grant of Access Easement, July 11, 2006

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TMK Nos. (3) 1-2-010-002 and 003
[Grant of Access Easement burdens TMK No. (3) 1-2-010-001 and benefits TMK Nos. (3) 1-2-010-002 and 003]

WARRANTY DEED AND GRANT OF ACCESS EASEMENT

KNOW ALL MEN BY THESE PRESENTS:

THAT, effective as of the __ day of _____, 2006, **THE TRUST FOR PUBLIC LAND**, a California nonprofit public benefit corporation, whose address is 116 New Montgomery Street Third Floor San Francisco, California 94105, hereinafter referred to as "Grantor" and the **OFFICE OF HAWAIIAN AFFAIRS**, a body corporate and instrumentality of the State of Hawai'i, whose address is 711 Kapi'olaniBoulevard, Suite 500, Honolulu, Hawai'i 96813, hereinafter referred to as the "Grantee," for a valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor does hereby grant, bargain, sell and convey unto Grantee, its successors, assigns and representatives, in fee simple, those certain parcels of land situate at Puna, Island and County of Hawaii, State of Hawai'i, designated as "Wao Kele o Puna," containing an area of ± 25,855.891 acres, more particularly described in Exhibit "A" attached hereto and made a part hereof.

TOGETHER WITH a non-exclusive easement for access purposes granted to The Trust for Public Land, a California nonprofit public benefit corporation by C.R. Churchill, D.A. Heenan, Richard W. Gushman, II and Ronald J. Zlatoper, the duly appointed, qualified and acting Trustees Under The Will And Of The Estate Of James Campbell, Deceased, acting in their fiduciary and not in their individual capacities, by that certain Grant of Easement for Access Rights made as of July 14, 2006 and recorded in the Bureau of Conveyances of the State of Hawai'i ("Bureau of Conveyances") on July 14, 2006 as Document Number 2006-129681, over, across and through the road shown on the map attached hereto as Exhibit C-1 and incorporated herein by reference, which crosses the property described in Exhibit C-2 attached hereto and incorporated herein by reference, for the benefit of both Tax Map Key Nos. (3) 1-2-010-002 and 003, subject to the terms and conditions set forth therein.

AND the reversions, remainders, rents, income and profits thereof, and all of the estate, right, title, and interest of the Grantor, both at law and in equity, therein and thereto.

TO HAVE AND TO HOLD the same, together with all improvements, rights, easements, privileges and appurtenances thereunto belonging or in anyways appertaining or held and enjoyed therewith in fee simple unto said Grantee, the Grantee's successors and assigns, forever, free and clear of all liens and encumbrances except as described on Exhibit "B" attached hereto.

The Grantor, for itself, its successors and assigns, does hereby covenant with the Grantee, its successors and assigns, that the Grantor is lawfully seised in fee simple and possessed of the above-described land and premises, that it has a good and lawful right to convey the same as aforesaid, that the same is free and clear of all liens and encumbrances, except as noted on Exhibit "B" and that it will and its successors and assigns, shall WARRANT AND DEFEND the same unto the Grantee, its successors and assigns, forever, against the claims and demands of all persons whomsoever.

AND the undersigned hereto agree that this instrument may be executed in counterparts, each of which shall be deemed an original, and said counterparts shall together constitute one and the same instrument, binding all of the parties hereto, notwithstanding that all of the parties are not signatories to the original or the same counterparts. For all purposes, including, without limitation, recordation, filing and delivery of this instrument, duplicate, unexecuted and unacknowledged pages of the counterparts may be discarded and the remaining pages assembled as one document.

SIGNATURE PAGE TO FOLLOW

IN WITNESS WHEREOF, the parties have executed this instrument as of 11th day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By Brian R. Kuebler

Its REGIONAL COUNSEL

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

IN WITNESS WHEREOF, the parties have executed this instrument as of 13th day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By _____

Its _____

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
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Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

ACKNOWLEDGEMENT

State of California
County of San Francisco

On this 11th day of July, 2006, before me, **Hsiao-Wen Shih**, a notary public, personally appeared **Brian R. Kirchoff** personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~) and that by his/~~her/their~~ signature(s) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

HSIAO-WEN SHIH
COMM. #1556982
Notary Public-California
SAN FRANCISCO COUNTY
My Comm. Exp. Mar 4, 2009

Appendix N

Development of Iceland's geothermal energy potential for aluminum production
– a critical analysis

Jaap Krater and Miriam Rose

Abstract

Iceland is developing its hydro and geothermal resources in the context of an energy master plan, mainly to provide power for expansion of the aluminium industry. This paper tests perceptions of geothermal energy as low-carbon, renewable and environmentally benign, using Icelandic geothermal industry as a case study.

The application of geothermal energy for aluminium smelting is discussed as well as environmental and human rights record of the aluminium industry in general. Despite application of renewable energy technologies, emission of greenhouse gases by aluminium production is set to increase.

Our analysis further shows that carbon emissions of geothermal installations can approximate those of gas-powered plants. In intensely exploited reservoirs, life of boreholes is limited and reservoirs need extensive recovery time after exploitation, making geothermal exploitation at these sites not renewable in the short to medium term. Pollution and landscape impacts are extensive when geothermal technology is applied on a large scale.

Background

Iceland is known for its geysers, glaciers, geology and Björk, for its relatively successful fisheries management and its rather unsuccessful financial management. But this northern country also harbours the largest remaining wilderness in Europe, an endless landscape of volcanoes, glaciers, powerful rivers in grand canyons, lava fields, swamps and wetlands teeming with birds in summer, and plains of tundra covered with bright coloured mosses and dwarf willow.

In 2006, 57 km2 of one of the most magnificent areas of the country, the wild highland plateau north-east of the large Vatnajokull glacier, was inundated for Europe's largest hydro complex, the 690 MW Karahnjukar dams. The energy from the dams went to a single new aluminium smelter built by the American transnational corporation Alcoa. On the day of the flooding, 15.000 people (out of a population of 320.000) demonstrated against the project. The protests against the

Karahnjukar dams launched a wider movement aimed at protecting Iceland's wilderness from heavy industry.

Icelanders, who had been divided over the perceived costs and benefits, were shocked by the devastation wrought by the project. Since the flooding, strong winds in the highlands have eroded silt from the rising and falling water table and dust storms are affecting an area much vaster than the reservoir. Mud rains fall in the East fjords where many local industries closed after the smelter was built. Seal colonies in the delta of the dammed rivers are diminished and some of the most important breeding grounds of vast colonies of rare skua, geese and duck species are gone. 3% of the Iceland's landmass is affected by the Karahnjukar project2. Impact of large dams on climate has been found to be higher than previously assumed due to methane emissions from reservoirs3 and it has recently become clear that this is also significant for high latitude reservoirs such as Karahnjukar4. Damming Iceland's glacial rivers prevents the flow of mineral rich silt (containing calcium and magnesium) to the sea. These nutrients feed marine phytoplankton, the start of most marine food chains. The damming of Iceland's glacial rivers not only decreases food supply for fish stocks in the North Atlantic, but also impacts oceanic carbon absorption, and therefore the global climate5.

The promise of environmentally friendly hydropower turned out to be a false one for the dams in east Iceland. Now, similar promises are being made for geothermal energy as a clean power source. In this chapter we review the development of geothermal energy in particular and examine its sustainability, environmental impact and some of the associated social and economic issues related to recent industrialisation in Iceland.

Cheap energy, minimum red tape

Iceland, with its vast possibilities of hydroelectric and geothermal energy, became an appealing target for heavy industry corporations such as Alcoa, RioTinto-Alcan and Century Aluminum. In a world increasingly concerned about carbon emissions, the clean image of hydroelectric and geothermal energy is appealing. Though heavy industry processes have an implicitly high environmental impact, they can be made to appear greener by using 'renewable' energy. To this end Iceland was granted an exemption for 'green-powered' industrial emissions under Kyoto, and pollution control schemes are lenient, encouraging industrial investment6.

The wholesale of Iceland's energy resources began in 1995 when the Ministry of Industry and Landsvirkjun, the national power company, published a brochure entitled "Lowest energy prices!!"7. The brochure glorified the country as having the cheapest, most hard working and healthiest labour force in the world, the cleanest air and purest water – as well as the cheapest energy and "a minimum of environmental red tape".

For ten years former Prime Minister Davíd Oddsson (who became the central bank director largely blamed for the collapse of the Icelandic economy) led the campaign to attract energy intensive, and therefore often highly polluting industries. In 1998, Century Aluminum constructed their first smelter in Iceland at Hvalfjordur, to be expanded eight years later. Three to five new aluminium smelters were planned. The existing Alcan (now Rio Tinto) smelter and a steel factory was to be expanded and an anode factory erected. An energy master plan was drawn up to harness the 30 Twh of electricity needed; dozens of dams would be built in every major glacial river, and nearly all geothermal areas would be exploited.

Not everyone agreed with the projects. In 2004, at the third European Social Forum in London, Icelandic environmentalists made an international call for help. That year, the international campaign Saving Iceland was formed to oppose the masterplan8. In consecutive years, four summer action camps were held. A number of years of direct action as well as mainstream protests by celebrities such as Sigur Ros and Björk and Icelandic intellectuals have seen the cancellation of some of the most damaging projects. Still, construction of a number of new dams in rivers Thjorsá and Tungnaá is planned to start this year (2009) to provide power for expansion at Rio Tinto-Alcan's existing smelter, a data centre and a number of silicon refining plants by corporations who's names are kept hidden by Landsvirkjun.

Cheap imported labour

Large dam projects in the majority world have been associated with mass displacements and 'cultural genocide' on an enormous scale9. Comparatively, the social impact of the developments in Iceland is small. Nonetheless cheap energy and labour is just as important to corporations operating in Iceland as elsewhere. Special arrangements are made by governments for subsidised borrowing and tax cuts, loans for expensive dam and geothermal projects are taken by the state-owned power company at the taxpayers risk, while the price paid for energy is kept secret, and depends on world price of aluminium. Thus the taxpayer directly subsidises every ton of aluminium when its market price drops. Imported cheap labour and low workers rights standards are routinely employed on construction sites. More than a dozen Chinese and other foreign workers died in construction of Karahnjukar, and more recently two Romanian workers suffocated in geothermal drill pipes on the site of a work camp near Reykjavik where they sometimes work up to 72 hour a week and shifts of sometimes 17 hours10. Workers are effectively confined to the camps for their 3-5 month work periods, going out to the capital once a month.

'Kuwait of the North'

Now that Icelanders have realised the full impact of Karahnjukar, public opinion is less favourable to large dams, and power companies have shifted their focus to geothermal exploitation. Currently the Hengill area east of Reykjavik is being developed on a large scale for the recently completed expansion of the Century Aluminum smelter in Hvalfjordur. Test drilling is taking place in four fields (Krafla, Bjarnarflag, Theistareykir and Gjastykki) in the north of the country for a new Alcoa smelter near Husavik. Brennisteinsfjöll, Krísuvík and Reykjanes fields, southwest of Reykjavik, are planned to be developed for a new Century smelter. The national power company plans to triple geothermal power capacity to 1500 MW, on top of the 575 MW currently generated by geothermal, of which a large proportion already goes to the two existing smelters in the Reykjavík area. Also, a new public-private consortium has been formed to develop deeper drilling of geothermal fields, which would amplify the scale of geothermal production and power generation potential.11 Ultimately, it is proposed that all of the economically feasible hot spring areas in Iceland will be exploited for industrial use, including a number of sites located in Iceland's central highlands, the beautiful heart of Iceland's undisturbed wilderness12. Landsvirkjun, without any irony, has termed Iceland 'the Kuwait of the North'13 Geothermal promises Geothermal potential with current technology is found at hotspots on the earth's surface, where magma intrudes into the rock bed and heats porous rock to high temperatures14. Electricity is generated by drilling into these reservoirs and powering turbines with high-pressure steam emitted from boreholes. The original geothermal power stations and boreholes supplying domestic needs in Reykjavik are small-scale installations that efficiently provide electricity, hot water, and heat, from sources in close proximity to the city, and are fairly sustainable.

As with any form of energy generation, there are environmental issues with geothermal exploitation that should be taken into account. These impacts are exacerbated significantly by the greater scale and intensity of production that energy-intensive industries require. But the quick-to-embrace enthusiasm for any technological solutions that promise to be a way out of our fossil fuel addiction, have tended to gloss over the downsides of geothermal exploitation and promote its intensive commercial use. Geothermal energy has the image of being sustainable, carbon neutral and of low environmental impact. How does this image compare to reality?

Renewable

Geothermal reservoirs have a sustainable production level if the surface release of heat is balanced by heat and fluid recharge within the underground reservoir15. This happens naturally in undisturbed hot springs, which have remained at more or less constant temperature over hundreds of years, but these recharge rates are generally not sufficient for exploiting

economically16. The Geyser hot springs at Calistoga, USA experienced a 150% decrease in production over ten years, due to rapid exploitation to meet economic requirements, and there have been many similar cases17.

Extracting super heated steam and fluids eventually causes a drop in pressure and temperature of the reservoir. Re-injection of fluids maintains pressure but has a cooling effect and best available technology cannot fully re-inject all extracted fluids, as significant amounts of steam and wastewater is released into the environment18.

Boreholes are usually modelled for only 30 years of production19. Recovery of reservoirs used for commercial energy generation takes 100-250 years before being viable for exploitation again, while in shallow, decentralised heat pump systems used for home heating, recovery time roughly equals production time20. Another problem is that geothermal hotspots like Iceland are seismically active zones. In Iceland, it has occurred that two thirds of boreholes in a field were destroyed by quakes.21 Compared to the geological time scale of oil regeneration, geothermal energy is relatively renewable. However geothermal energy cannot truly be called a renewable energy source and boreholes need to be decommissioned after a few decades.

Carbon-neutral

Geothermal gases are rich in various elements and chemical compounds (such as sulfur). Carbon dioxide is present in quantities reflecting of this chemical make up which is distinct to each area. In Krafla (North Iceland), CO2 makes up 90-98%, the rest being hydrogen sulphide22.
Calculations based on the national power company (Landsvirkjun)'s site study for current North Icelandic geothermal developments reveal that the 400 MW of boreholes planned for a single Alcoa smelter in Húsavík will release 1300 tonnes CO2 per MW23. An average gas powered plant would produce only slightly more, 1595 tonne per MW24. The total of 520,000 tonnes CO2 for these fields alone is almost equivalent to all road transport in Iceland25.
In Iceland, a single site emitting over 30,000 tonnes requires an emissions permit. Conveniently, figures for current geothermal power stations hover just under that figure. Either way, Icelandic authorities do not consider emissions from geothermal plants anthropogenic and do not include them in greenhouse gas inventories, although currently operating plants emit 8-16% of the country's total emissions26.

Minimal environmental impact

Geothermal fluids contain high concentrations of heavy metals and other toxic elements, including radon, arsenic, mercury, ammonia and boron, which are damaging to the freshwater systems into which they are released as waste water. Arsenic concentrations of 0.5 to 4.6 ppm are

found in wastewater released from geothermal power plants; the WHO recommends a maximum 0.01 ppm in drinking water27. Hydrogensulphide (H2S) is a main component of geothermal steam and is responsible for the rotten egg smell of geothermal areas. It is corrosive and classed as very toxic28. H2S is a heavy gas and can linger in valleys, polluting local populations29. It forms sulphurdioxide (SO2) in the atmosphere causing acid rain. Geothermal power accounts for 79% of Iceland's H2S and SO2 emissions30.

In 2004, sulphur pollution in Reykjavik had reached levels regarded as "dangerous"31. In 2008, sulphur pollution from the Hellishei"i power station, 30 km away, was reported to be turning lamposts and jewelry in Reykjavík black. A record number of objections was filed to two more large geothermal plants in the same area, which would have produced more sulphur and carbon emissions than the planned smelter they were supposed to power, and plans were put on hold. In the North the town of Reykahli" will become exposed to 32,000 tons of H2S per year32 if the geothermal power plants (for which feasibility studies are now complete) are built. High levels of sulphur pollution are associated with increased mortality from respiratory diseases33. Landscape impact is another significant factor. Each geothermal borehole drilled only produces a few megawatts of power, and may be located across a large area, connected to the main power station with pipes and roads. Numerous test holes are drilled for every borehole that goes into production. A currently ongoing project, the proposed expansion of Hellishei"i, demands more than 100 boreholes in a stunning area of wilderness, providing 160 MW, less than half of what is needed by the smelter it will power34.

Areas such as Hellishei"i are globally rare, very beautiful and scientifically interesting. Icelandic geothermal areas are characterised by colourful striking landscapes, hot springs, lavas and glaciers, and are biologically and geologically endemic to the country. In the extreme conditions of heat and salt found at each hot spring or cave, extremophiles, unique mosses and bacteria, develop, such as Hveraburst, a heat tolerant moss found only in Iceland's Hverager"i hot spring area. Research into these primeval species is in its infancy, and already has led to greater understanding of the formation of life on earth, and the possibilities of evolution of extraplanetary life. Irreversible disturbance to these wild areas for power plants includes roads, powerlines, heavy lorries and loud drilling equipment. It has also been suggested that depletion of one geothermal reservoir can result in the drying of surrounding hot spring areas35. Thus the direct environmental impact of geothermal extraction may be much larger than previously thought, and landscape is a key consideration.

100% renewable, double the emissions

In conclusion, the impacts from geothermal energy that is developed on a large scale such as is currently happening in Iceland, are greater than generally assumed. As regards climate issues,

Iceland may end up in an extraordinary position. The Icelandic ministry of environment has calculated that if only some of the planned industrial projects continue36, greenhouse gas emissions in 2020 will be 63% higher than in 1990 (assuming that emissions from geothermal and hydro plants are nil)37. If all projects continue and emissions are taken into account, Iceland's climate footprint, powered by 100% 'green' energy could double (again, this figure excludes emissions from geothermal or hydro plants).

This is made possible because the country was not just granted a generous 10% increase under Annex 1 of the Kyoto Protocol, but also took advantage of a specific exemption for emissions of heavy industry powered by 'renewables'.

Iceland has also been mentioned in proposals for a European (or even global) green energy super grid38. The calculations brought forward here suggest that it is not worthwhile to replace gas-powered plants by Icelandic geothermal. If that electricity is to be used for growth of heavy industry, it is quite arbitrary for the climate whether that would be in Iceland or mainland Europe. The aluminium industry is set to increase its emissions by a fifth by 2020 (see Box 1: The aluminium industry, climate and green energy) and this includes its embrace of non-fossil energy.

As an alternative, Landsvirkjun has taken to lobbying data centre corporations, silicon refineries and other energy intensive industries with better public images than Rio Tinto to come to Iceland. If such plans go ahead, Iceland would become a large hard disk for the global Internet. Again, moving gas-powered servers from Europe to geothermal-powered servers in Iceland does not significantly decrease emissions.

And there is another reason not to embrace these projects. Wilderness areas are becoming rare globally, with over 83% of the earth's landmass directly affected by humans39, and the Icelandic wilderness is one of the largest left in Europe. It provides important regulating ecosystem services and has aesthetic, scientific, medical, cultural and spiritual significance for humans. However, we believe all landscapes, ecological systems and forms of life have their own intrinsic value and right to develop for themselves, rather than for the sole benefit of mankind. We believe the dominant world-view that sees the natural world as a collection of 'resources' has greatly contributed to severe ecological and social crises. To recover from the consumption paradigm we must redefine our environmental ethic and what it means to be human, to include a profound sense of the fragile and beautiful interconnection of life on earth.

Proponents of heavy industry in Iceland have stated that it is the country's 'ethical obligation' to sacrifice the country's wild areas for the sake of the environment40. While this is more likely than not moral opportunism on the side of those who are to benefit from the projects, the

technological or pragmatic environmentalism in favour of super grids and mega data centres comes down to a proposal to sacrifice unique ecological areas for the of greater good of living a resource-intensive i-life style 'sustainably'. In contrast, for anyone who identifies with a natural area, it is easy to understand why it has a value of it's own. Given the rarity of wild lands in this context, the value can be seen as far greater than that of any of our possessions; it is in a sense, invaluable.

What can perhaps be concluded from this Icelandic green energy case study, is that application of a technology that has been thought of as renewable, climate-friendly and low-impact, on the large scale that is associated with fossil fuels, makes it a lot like the technology it was supposed to replace. It has certainly been argued that technological systems tend to reproduce themselves independent of the specific technologies41 42. Simply applying a different technology to address issues that are not entirely technological, is not addressing the problem of our over consumptive lifestyles. But it can end the existence of a place that is not like any other, irrevocably.

The aluminium industry is the world's most energy–intensive industry, and also one of the most polluting43. Aluminium is derived from bauxite soils, mainly found in the tropics and subtropics. Five tonnes of bauxite is strip mined to produce one tonne of aluminium. Large scale deforestation of tropical forests caused by shallow open cast mining creates soil erosion and water pollution and has displaced and destroyed the livelihood of numerous indigenous peoples in Australia, India, Brazil and elsewhere, a process which continues to this day44 45. Bauxite is refined to produce alumina and leave red mud, a caustic mixture of heavy metals and radionuclides, which is known to cause silicosis, cancer, and other diseases associated with radiation46.

Alumina is smelted using carbon anodes and aluminium fluoride to remove the strongly bonded oxygen. This part of the process is most energy intensive and produces inorganic fluorides, SO2, CO2 and perfluorocarbons (very strong greenhouse agents) in the airborne waste, as well as solid spent pot linings containing cyanides and fluorides. Approximately 30% of aluminium is used for arms production and defence; the remainder is used for cars, planes and construction, packaging and disposables47 48.

Cradle to grave

Metal giants have not enjoyed a particularly good environmental reputation. Rio Tinto was described by motion in the British parliament in 1997 as "the most uncaring and ruthless company in the world", for human rights, anti-unionising and total disregard for indigenous people49, and was pulled up again in 2000, for war crimes, environmental destruction and

racism50. Recently the corporation was thrown out of the Norwegian Government pension fund for similar reasons51.

Century Aluminum's Icelandic smelter has been accused of forcing injured workers back to work52 and of producing illegal amounts of fluorine pollution causing health problems53. The company is working with the Sassou government of Congo- Brazzaville, a single-party regime which came to power in fraudulent elections in 2002, to develop large scale open cast bauxite mining54 55. It's bauxite mining and refining in Jamaica has been responsible for large-scale rainforest destruction and water pollution56 57 58. Alcoa has been convicted numerous times for toxic waste dumping in the US59, old-growth and rainforest destruction and displacement of indigenous people in countries such as Brazil, Suriname and Australia60 61 62. Alcoa has lost popularity in Iceland for its intimate association with the US military, which is categorically denied by Alcoa Iceland (although it has a website dedicated to it's military products)63. In Honduras, an Alcoa car parts factory was accused of treating workers worse than sweatshops. The basic pay of 74 cents an hour covered 37% of an average family's most essential needs, and in the last three years, wages fell by 13%. Workers would be forced to urinate and defecate in their clothes after being repeatedly denied to use the bathroom and women would have to take off clothes to prove they were menstruating. Protests by workers in 2007 led to 90% of the trade union leaders being fired64.

Nonetheless, Alcoa claims to be one of the worlds most ethical and sustainable companies, according to a host of international awards listed by the company65. Their website (subtitled 'Eco-Alcoa' – 'Click here to see how Alcoa is part of the solution') is dominated by articles on community projects and energy saving initiatives, and with former Greenpeace and WWF directors at the helm, they are doing well to promote a green image. In a recent presentation, Alcoa state they are on the cutting edge of green corporate thinking, embracing recycling and green energy and even claiming to be carbon-neutral, as a whole industry, by 202066. Are these promises coming true?

Recycling

Recyclability of aluminium is probably the most important selling point for the industry: "It's more like reincarnation than recycling"67. Recycling aluminium is indeed 95% more efficient than primary production; still, it takes the same amount of energy as producing new steel68. Alcoa sources only 20% of its aluminium from recycling. Overall recycling rates are 33% and, according to US Aluminium Association figures, going down69 70.

Renewable energies

The aluminium industry has long been closely tied to the hydro-industry71 and over half of smelting is hydro-powered72. Due to the low economic return per energy unit, smelting is increasingly geared towards countries with low energy and labour costs73 74 whether hydro (e.g. Brazil, Congo, Iceland, Greenland), natural gas (Trinidad, Congo-Brazzaville) or coal (South Africa, India). Indirect greenhouse gas production from dams and geothermal power stations are not included in the industry's audits.

Reducing greenhouse gas emissions

Aluminium production accounts for ca. 1% of global greenhouse gas emissions, producing 13.1 tons of CO2 equivalent per ton of aluminium75. Technological advances have led to 20-25% emissions savings in the smelting process in recent decades but overall emissions are increasing and there is no concrete intention to reduce them. In fact, Alcoa predicts a 20% increase of CO2e emitted per year from ca. 335 million tonnes of CO2e in 2000 to ca. 400 million tonnes in 202076 (see figure).

Figure 1. Projection of greenhouse gas production by the aluminium industry (Adapted from Overbey, 200577)

Carbon neutral

However, Alcoa states that around that time, cars will contain more aluminium, be lighter and thus save fuel. This saves carbon emissions, and in 2017, the amount saved will be roughly the same as the increase in emissions by the aluminium industry. Thus, the industry can be carbon neutral whilst producing 20% more greenhouse gases. The fallacy of this reasoning is easy to see: imagine we would drive even more and in larger vehicles than Alcoa is projecting. In that case the industry would be carbon neutral even earlier: if I buy an aluminium hummer, I save more than when I buy an aluminium fiesta. Even if crediting would work that way, Alcoa assumes the aluminium industry get all the credits, not the car manufacturer or consumer.
The aluminium industry, like all mining industries, has a severe environmental impact and a consistent record of human rights violations. Because the industry is in all aspects 'part of the problem', it is vitally important for corporations such as Alcoa, to join the green bandwagon and proclaim 'it is part of the solution'. However, ecologically responsible primary aluminium production is not a reality. If Iceland is the model for green heavy industry, one must question whether that is possible at all.

In times of economic crisis, it is tempting to embrace new megaprojects such as new power plants and aluminium smelters. But will this realistically improve Iceland's economic prospects? Prime minister Geir Haarde recently explained on Stöd 2's chat show Mannamál that one of the main reasons for the fall of the Krona, was due to the execution of heavy industry projects: the construction of Kárahnjúkar and Alcoa's smelter in Rey"arfjör"ur. If more large projects are executed, what will the cost be for the Icelandic taxpayer?

Haarde's comments were not surprising. Before construction of Kárahnjúkar many economists predicted the negative impact on inflation, foreign debt and the exchange rate of the ISK. Of course there is some economic benefit from new smelters, but "it is probably outweighed by the developments' indirect impact on demand, inflation, interest rates and the ISK exchange rate," stated a report by Glitnir in 2006 on the impact of aluminium expansion in Iceland. The report expected an increase in inflation and a depreciation of the ISK.

"Kárahnjúkar will never make a profit, and the Icelandic taxpayer may well end up subsidising Alcoa," said the eminent economist Thorsteinn Siglaugsson after publishing another report on the profitability of the Alcoa dam in East Iceland before construction commenced.

How did the Fjardaal smelter contribute to Iceland's economic crisis? The two billion dollars for the construction of the country's largest dam had to be borrowed by the state. That led to a more than significant increase in the current account deficit, which is now felt in increased inflation and depreciation of the currency. The economic cost now needs to be coughed up.

Note that any schemes that demand new power plants associated with a significant amount of borrowed capital will have this effect, whether an expensive dam or power plant is meant for aluminium, a silicon refinery, data centre or some other purpose. It is quite simple. If you borrow money, you will have to pay back in one-way or the other.

Of course, once they are built, smelters bring in some degree of income to the country and, so it is argued, there are local economic benefits from a new smelter. Smelters provide jobs. What has hardly been researched in Iceland, though, is how much these new jobs displace jobs in existing local industries.

Local industries around Rey"arfjör"ur have had to shut down as a consequence of employment competition from the smelter. Many new houses that were built are empty. Between 2002-2008, on average 73 more people moved each year from the Eastfjords to the southwest than the other way round. The smelter still depends on many foreign workers. Local communities where large projects such as Fjardaal get constructed become completely dependent on foreign investment, an undesired and unsustainable condition that destroys local resilience.

There is another reason not to construct more smelters in Iceland. The price that the aluminium giants pay for energy to Landsvirkjun is linked to the world price of aluminium. If supply is increased this will lower the price of aluminium, decreasing revenue for Iceland. One might think that a few hundred thousand tons of aluminium more or less will not impact the global market. The reality is that it is not the sum of production that determines the price but rather the friction between supply and demand. A small amount of difference can have a significant effect in terms of pricing. Demand for aluminium is already slumping in the US and Europe. It will too in China when growth slows down there, which is likely to happen before Alcoa's and Century's planned new smelters could come online, considering the world economic outlook.

The metal corporations compete between themselves. Because of this is not just the global price that determines their profitability. The bottom line is eventually determined by how cheaply they can produce. For aluminium, profitability is fundamentally determined by one thing: energy costs. In Iceland, energy prices are rock bottom – the lowest in the world. It is not a coincidence that as Alcoa's Fjardaal smelter went online, 400 workers in Rockdale, Texas were laid off as smelter operations there closed down. In the US, Alcoa pays much more for power.

This is why Alcoa, Century, Rio Tinto and Norsk Hydro all want new smelters in Iceland and in third world countries with cheap energy such as Trinidad and the Congo. When demand slumps, expensive plants can then be shut down in favour of cheap ones such as the proposed smelters at Husavik and Bakki. As inflation stays high and energy revenues low, the Icelandic taxpayer pays the price.

Construction of new power plants, smelters or other large scale projects will have some short term economic benefit as funds are infused into the economy. But, as Geir Haarde recently confirmed, after execution comes the economic backlash. These megaprojects in a small economy have been compared to a 'heroin addiction'. Short- term 'shots' lead to a long-term collapse. The choice is between a short-term infuse or long-term sustainable economic development.

The 'shot' of Fjardaal overheated the Icelandic economy. What was called the 'Kárahnjúkar problem' led to an all time high in the value of the Krona, hurting export and the fish industry in particular. With the all-powerful currency, banks overplayed their hand and went into a spending spree. Drugs make you lose sight of reality.

There has been a lot of critique on the proposed plans to develop Iceland's unique energy resources. Those in favour of it have generally argued that it is good for the economy. Anyone who gives it a moment of thought can conclude that that is a myth. Supposed economic benefits

from new power plants and industrial plants need to be assessed and discussed critically and realistically. Iceland is coming down from a high. Will it have another shot, or a cold turkey?

Footnotes

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Appendix O

Barriers to Geothermal Development

Dan Jennejohn
Research Associate, GEA
July 11, 2011

Barriers to Geothermal

- Geothermal project lead-times can take 4-8 years, or more, before a plant is brought online and projects face obstacles at key points throughout development

- Geothermal expansion faces obstacles in areas of:
  - Exploration and Drilling Technology
  - Project Finance
  - Project leasing and Permitting
  - Transmission
  - Workforce Development

Exploration and Drilling

- Exploration technology and techniques still maturing
  - **Most geothermal resources still "undiscovered" according to USGS**
  - **Pre-drilling exploration techniques rarely provide an unambiguous drilling target (≤50% drilling success rate)**
    - Drilling makes up nearly half of project costs
    - Successful drilling results are needed to secure financing
  - **Exploration technologies adapted from oil and gas sectors do not yield the same rates of success in geothermal exploration**
    - Increased research needed in geothermal exploration technologies
  - **Geothermal exploration and drilling have high risk profiles**
    - THEN: Exploration and drilling by large oil and resource companies who understand natural resources , have suitable risk tolerance and deep pockets
    - NOW: Geothermal industry is dominated by smaller companies with limited access to capital and are, therefore, more vulnerable to risk

Project Financing

- Resource risk still the biggest barrier to entry, very difficult to find commercial financing at this stage
  - **High up-front costs (exploration and drilling can account for nearly 50% of project costs)**
  - **High up-front risks (≤50% success rate for initial production well)**
- Significant equity financing (at least $15M) is required to prove a project's feasibility
  - **Seed capital: typically too little to support drilling**
  - **Venture capital: virtually non-existent for geothermal because of unacceptably high initial resource risk and a lack of understanding**
  - **Equity financing: available, but comes at a high price**
- Project returns may not be high enough to justify risk?
  - **Begs the question: Is geothermal energy properly valued relative to other energy sources?**

Project Financing Continued

- Project returns high enough to justify risk? Lead-time?
  - **Lenders seek return in 2-3 years, geothermal projects taking 4-8**
  - **Economic contraction made investors more risk adverse**
    - Before 2008: funding provided on the basis of ~25% of resource available at the wellhead
    - Since 2008: funding now requires 75 - 100% of resource available at the wellhead
    - Economic contraction reduced the number of entities seeking tax relief and banks providing tax equity financing
  - **Incentives often received at end of long development process**

Leasing and Permitting: Recent Successes

- Federal and state agencies have made significant progress in reducing lease processing delays
  - **Prior to the PEIS in 2008 lease processing took 2 – 3 years**
    - PEIS shortened the review process
      - ~230 of 271 leases offered between fall 2008 – fall 2010 were fully processed!
      - Process shortened to 9 months in states well versed in geothermal permitting
  - **BLM staff shortages and lack of geothermal experience addressed**
    - 2008, BLM Nevada Office worked closely with industry to expedite lease processing
    - Staff additions and EPAct revenue sharing helped to reduce lease processing delays
  - **Projects fare better in states where agencies are familiar with geothermal**

Leasing and Permitting: More Work to be Done

- Permitting Still Delaying Projects
  - **Approval of the Operations Plan (i.e. drilling of production/injection wells) and the Utilization Plan (i.e. plant construction) takes 0.5 to 1.5 years each**
  - **A variety of issues can delay or even stall projects indefinitely**
    - Cultural resources
    - Water rights
    - Wildlife habitat
    - Land acquisition
- Permitting Delays impact project financing
  - **Increases in project lead-time significantly increases project cost**
  - **Permitting must be entirely complete prior to obtaining construction financing**

Transmission

- Access to transmission is a critical barrier to project development
- Major geothermal "reserves" of at least 2000-3000 MW identified in CA are undeveloped due to lack of transmission access to CA markets!
- Build on recent successes: One Nevada Transmission Line (ON Line)Resources in Northern Nevada will finally serve Southern Nevada due to the new 500 mile, 500kv
- Continued support for transmission financing mechanisms through loan guarantees, bonds is needed
- Continued regional planning and interstate coordination (i.e. WECC) also necessary

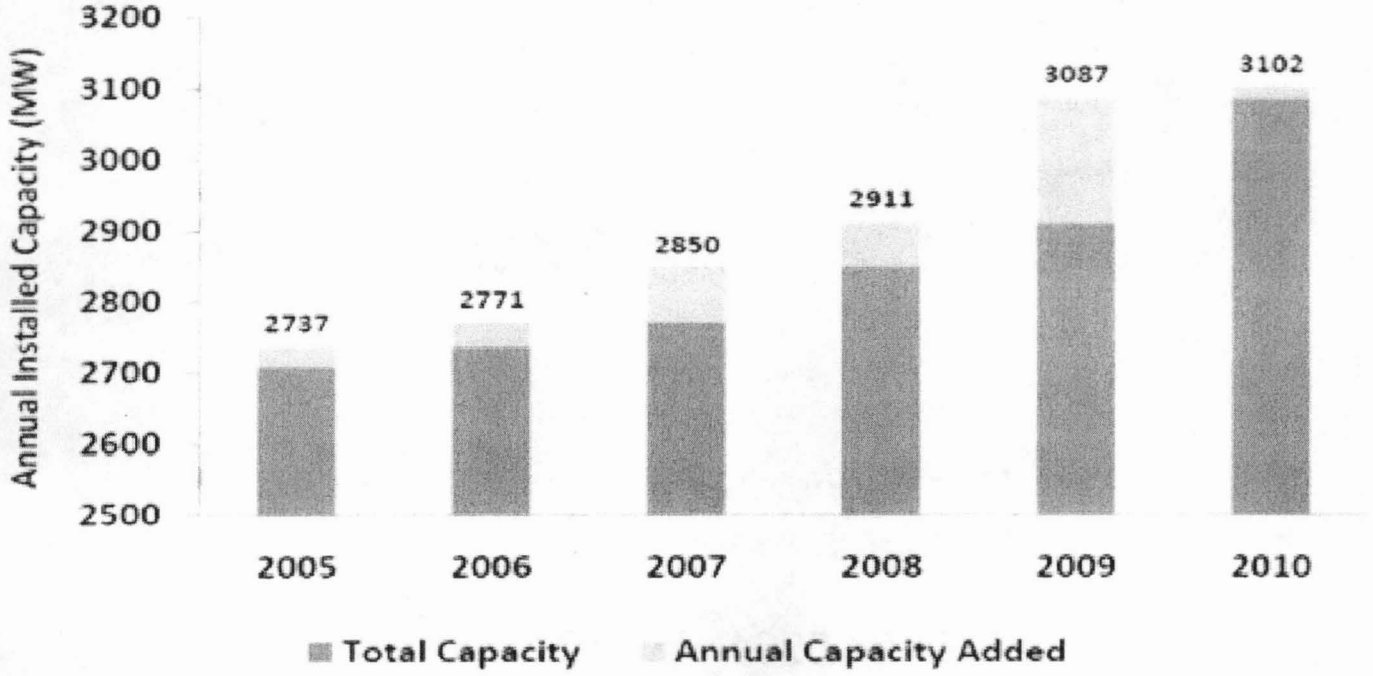
Workforce Development/ Education

- Rapid expansion of geothermal will require an expanding workforce, but...
  - **Current workforce is aging**
    - Similar issue to oil & gas – majority of skilled labor is over the age of 40
  - **Competition with oil & gas for an already small pool of graduates in areas of engineering and geosciences**
  - **Professionals have to be adapted from other industries (i.e. mining and oil and gas) to geothermal**
- Geothermal is labor intensive and industry is working to meet demand
  - **National Geothermal Academy**
    - 8 week intensive course held annually
    - Continued federal funding?

Still Moving Forward

- In spite of barriers industry still bringing power plants online

Figure 8: Total Installed Capacity 2005-2010



Thank You!

GEA

GEOTHERMAL ENERGY ASSOCIATION

Dan Jennejohn
Research Associate
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Appendix P

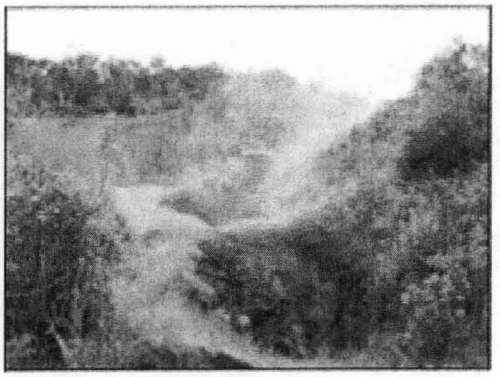
The Economic, Environmental, and Social Benefits of Geothermal Use in Hawaii

Liz Battocletti,
Bob Lawrence & Associates, Inc.
June 2006

Geothermal heat or water has been used in the Aloha State for centuries. Missionaries exploring Hawaii in the early 1800s witnessed the Native Hawaiians soaking in the warm springs. Today, naturally occurring steam vents and warm ponds are used for recreational and agricultural purposes.

Due to the state's geology, cracks in the earth in volcanically active areas allow steam to rise to the surface through vents. Some people stick coils of copper pipe into these "wild" steam vents to heat water. Others relax and rejuvenate in the many natural warm ponds located along the Puna coast.

Despite the wealth of geothermal resources, however, few small businesses directly use geothermal heat or water in Hawaii. The Kapoho Kai Nursery in Pahoa has built a small greenhouse over a steam vent. The steam heats the greenhouse, encouraging the landscaping palms to germinate. According to the owner, an added bonus is the steam's slight sulphur content which discourages the growth of unwanted pests.



Steam vents along the Sulphur Banks Trail near the Kilauea Visitor Center (Photo: U.S. Department of the Interior)

The 27-acre Steam Vent Mission in the Kingdom of Heaven, formerly known as the Steam Vent Inn and Health Retreat, contains more than 150 active steam vents. "A natural wonderland in tropical paradise" invites guests to "relax, rejuvenate, and heal in Hawaii's only lava-heated steam saunas and adjacent geothermal bathing pools."

The largest use of geothermal in Hawaii is electricity generation. Located about 21 miles south of Hilo on the Big Island of Hawaii, the Puna Geothermal Venture (PGV) has produced electricity from geothermal resources since April 1993.

PGV has an installed capacity of 30 megawatts (MW), and sells about 212 million kilowatt hours (kWh) per year to Hawaii Electric Light Company (HELCO). The geothermal plant supplies about 20 percent of the Big Island of Hawaii's total electricity demand.

Economic benefits

PGV benefits Hawaii's economy in many ways. It creates jobs. With an annual payroll of more than $3.8 million, PGV provides well-paying full-time jobs to about 30 people. Using a standard multiplier of 2.5, the geothermal plant creates 75 direct, indirect, and induced jobs in Hawaii.

In addition to job creation, PGV contributes to Hawaii's economy through local, state, and federal taxes, and royalties. The plant pays more than $2.5 million a year in taxes and royalties. In 2005, it paid $969,980 in royalties—50 percent goes to the state, 30 percent to the county, and 20 percent to the Office of Hawaiian Affairs.

Over the 13 years PGV has been generating electricity, the plant has paid about $50 million in payroll, and $32.5 million in taxes and royalties.

Last but not least, geothermal energy reduces the demand for imported oil, helping to stabilize the cost of electricity.

Imported petroleum currently supplies about 90 percent of the state's energy. In 2004, utilities spent $524.2 million on fuel for electricity production, passing the cost on to the customer, who in turn paid $1.656 billion for electricity.

Using indigenous geothermal resources, PGV has reduced the need to import more than 5 million barrels of oil since 1993. Using the average price per barrel from 2000 through 2005 of $26.78, PGV has resulted in an estimated cost savings of $144.6 million from 1993 to the present.

According to the Energy Resources Coordinator's 2004 Annual Report, "Every barrel of oil saved translates to more dollars available to the local economy, in addition to the many environmental benefits."

Environmental benefits

In addition to jobs, taxes, royalties, and reducing Hawaii's reliance on imported fuel, PGV prevents the emissions of greenhouse gases (GHG) and air pollutants. Since 1993, the Puna geothermal power plant has offset roughly 2.5 million tons of carbon dioxide emissions that would have been generated by a similar-sized fossil fuel plant. This is equivalent to 5.4 million barrels of oil. In addition, the plant annually offsets the emission of 1,328 tons of nitrogen oxides and 983 tons of sulfur dioxides (see Table 1).

In comparison, as a whole, Hawaii's electric industry emitted 29,000 tons of sulfur dioxide; 15,000 tons of nitrogen oxides; and 9 million tons of carbon dioxide in 2002. The annual GHG emissions are equivalent to burning 19 million barrels of oil.

The PGV geothermal plant also eliminates the need to ship fuel oil from the refineries on Oahu, reducing the risk of oil spills.

Social benefits

Social benefits are difficult to measure quantitatively. The Energy Resources Coordinator's 2004 Annual Report stresses energy's relevance to standard of living, a contributor to social well-being. The report notes that "Energy continues to be a key factor shaping Hawaii's economy, environment, and standard of living. A stable energy supply is essential to continued prosperity."

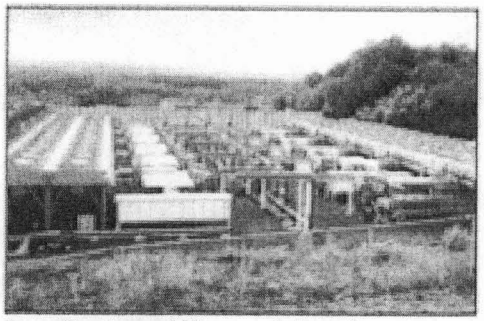
The use of indigenous energy resources, such as geothermal, results in predictable long-term electricity rates, and ensures that fewer dollars leave the state to purchase fuel and are instead available for other purposes within the islands' economy. A strong local economy includes a vibrant visitor industry: the Department of Business, Economic Development and Tourism (DBEDT) projects that Hawaii expects to host 7.7 million visitors spending 70,000 days and $12.4 billion in 2006.

The Future

Hawaii is rich with low- and medium-temperature geothermal resources which could be developed into thriving small businesses. Geothermal heat or water, including the waste heat from the Puna geothermal plant, could be used to dry fruit; provide cold storage or refrigeration; grow fish or other aquatic species; heat greenhouses; process agricultural goods, e.g., lumber, macadamia nuts, and animal feed; pasteurize or sterilize; and pamper guests in spas and resorts.

PGV has received permits to double its installed capacity to 60 MW. Doing so would likely also double the significant economic and environmental contributions it makes to Hawaii.

In addition, the State is exploring producing hydrogen via electrolysis using geothermal.



Puna Geothermal Venture, Pahoa, Hawaii (Photo: Ormat)

The potential for geothermal to contribute to Hawaii economically, environmentally, and socially—even more than it already does—is substantial.

				Annual Emissions Offset (tons)				
Name	**Location, County**	**Installed Capacity MWe**	**Annual Energy produced kWh**	**Nitrogen oxides**	**Sulfur dioxide**	**Carbon dioxide**	**Years online**	**Total Carbon dioxide offset (tons)**
Puna Geothermal Venture	Pahoa, Hawaii	30	212,060,000	1,328	993	148,817	13	2,559,552

Table 1 — Annual greenhouse gas and air pollutant emissions offset by Puna Geothermal Venture.

William P. Kenoi
Mayor

William T. Takaba
Managing Director

Walter K.M. Lau
Deputy Managing Director

County of Hawai'i
Office of the Mayor

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January 3, 2012

MEDIA RELEASE: FOR IMMEDIATE RELEASE
Contact: Desiree M. Cruz, Public Relations Specialist 961-8507

Geothermal Working Group- Final Report unveiled by the County of Hawai'i

(Hilo, HI) The Geothermal Working Group, with the support of Hawai`i County Mayor Billy Kenoi, will present the final draft of the Geothermal Working Group Report on Wednesday, January 4, 2011 at 2:30 p.m. The press conference will be held at the County building on the Mayor's lanai at 25 Aupuni St., second floor.

The report was sponsored by the County of Hawai'i to evaluate geothermal energy as the primary source of baseload power for electricity on the Island of Hawai'i. The report includes an analysis of technical data and expert testimony providing convincing rationale to develop local renewable energy plants and transition away from the county's dependence on petroleum-fueled generators for baseload electricity. The report, which is currently being circulated within Hawai`i's State Legislation, was developed as research to help support Hawai`i's Clean Energy Initiative goals.

Geothermal Working Group Co-Chair Wally Ishibashi, will present the report in detail, with supportive comments presented by Mayor Kenoi. Geothermal Working Group Co-Chair Richard Ha will discuss the important issues surrounding peak oil and its relevance to Hawai`i Island. Ha recently traveled to Iceland where he observed how the country recovered from the biggest financial crash in modern history. Ha stated, "They are recovering because they inoculated themselves from high oil prices by using low cost hydro and geothermal for 100 percent of their electricity and house heating. It is clear to me that had they used expensive biofuel to generate electricity, they would not be competitive in making aluminum for export. And instead of coming out of this disastrous financial situation, they would be facing years of depression. This is exactly why Hawai'i should not be using expensive biofuels to make electricity when we have low-cost geothermal."

Ha was also sponsored by the County of Hawai'i to attend this year's Association for the Study of Peak Oil Conference, which took place this past October in Washington, DC, and will present his findings at the press conference.

For a full copy of the Geothermal Energy Working Group - Interim Report, please go to

http://www.hawaiicounty.gov/research-and-development

####

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

County of Hawai'i
Office of the Mayor

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Geothermal Energy Working Group
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

Wednesday, June 2, 2010
Office of the Mayor

CALL TO ORDER

The inaugural meeting was called to order by Co-Chairman Richard Ha at 3:10 p.m. Co-Chairman Ha introduced Mayor Billy Kenoi.

PRESENT:

Carlito Caliboso
Richard Ha, Co-Chairman
Nelson Ho
Jacqui Hoover
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Ted Peck

GUEST SPEAKERS
Jose Dizon, HELCO
Mike Kaleikini, Puna Geothermal Venture
Mayor Billy Kenoi
Council Member Emily Naeole-Beason

Mayor Kenoi thanked everyone for their support of the newly formed Geothermal Energy Working Group. He acknowledged the presence of Councilwoman Emily Naeole-Beason.

Mayor Kenoi stated that everyone recognizes that energy and its cost moving forward determine the quality of life for island residents. It is essential to address the importance of renewable and alternative energy development. He explained that the Hawai'i Clean Energy Initiative aims to have the State obtain 70 percent of its energy from renewable energy sources by 2030. If there is any community that will achieve that goal, it is the County of Hawai'i, because it is already at 32 percent.

Mayor Kenoi stated that in order to accomplish this goal it is necessary to maximize the availability and the opportunity that surrounds geothermal. Senate Concurrent Resolution 99 (SCR 99) directs Hawai'i County to establish a working group to analyze the potential development of geothermal energy making it cost effective and feasible. The Geothermal Working Group will consider the expansion of geothermal development and address its impact on the environment and its culture.

Mayor Kenoi stated that he feels confident that the members selected consist of talented individuals who will make significant and substantial strives in expanding and utilizing the "gift of geothermal."

Councilwoman Naeole-Beason offered a short prayer to spiritually guide the members in wisdom, knowledge, and understanding.

Councilwoman Naeole-Beason commented that she witnessed the process of geothermal and how it has evolved throughout the years. She supports the newly formed group and looks forward to the county providing new sites for geothermal. As a result of Puna geothermal, she is presently the only councilmember on Hawai'i Island who is capable of utilizing royalty funds to take care of her district. She hopes that in the future other Council districts will be able to benefit from geothermal.

Co-Chair Ha thanked everyone for supporting the newly formed Geothermal Energy Working Group. He explained that this working group will need to file an interim report with the Legislature prior to the start of its 2011 session. In the next seven months, the group is directed by SCR 99 to analyze the potential development of geothermal energy as the primary energy source that can meet the base load demand for electricity on the Big Island.

As a farmer, Co-Chair Ha stated that in the past he attended several seminars. He learned about the concept of energy return on investment, and the standards of rural oil supplies. Studies indicate that the end of cheap oil is near. Individuals who are less fortunate financially will be the most vulnerable. Co-Chair Ha explained that according to HELCO's website, geothermal energy costs approximately 11 cents per kilowatt hour for base power. Based on this figure, it is by far the cheapest form of base power. Geothermal is proven technology: it's cheap, it's a gift to use wisely, and it can be shared with future generations. Also, there are future possibilities to develop with geothermal including transportation, fertilizer, ammonia, etc.

Representing the Big Island Labor Alliance, Co-Chairman Wallace Ishibashi explained that in the 1980's he was a member of the first geothermal group called the Hawai'i Island Geothermal Alliance (HIGA). At that time, it was a touchy subject, however; over the course of time the first phase of geothermal has proven to be very effective, clean, and beneficial to Hawai'i island. Mr. Ishibashi said that he continues to take interest in the development of geothermal because "it is the right thing to do Geothermal energy is available in only certain regions of the world and Hawai'i Island is blessed to have this resource."

Co-Chair Ishibashi stated that the Hawaiian community may possibly have concerns regarding this issue. It is the Geothermal Energy Working Group's responsibility to address them openly with understanding and aloha. He said, "the fact is Pele is recognized as a living goddess to some Hawaiians in the community. It is important to acknowledge the communities issues with respect and understanding of their culture."

In order for geothermal to succeed, Co-Chair Ishibashi commented that the key is for businesses and the working class to see a difference in their electric bill. Once businesses receive savings, they can than afford to provide better wages to their workers. He also commented that many people believe that there is a price to pay in order to live in Hawai'i. Co-Chair Ishibashi stated that that way of thinking must change. The fact is that cheaper energy attracts better business opportunities for our islands. Geothermal will reduce the cost to Hawai'i residents and business operators. Therefore, the goal is to attract better business in Hawai'i because this cheap base energy will allow affordable living.

Co-Chair Ha asked that all members introduce themselves.

Patrick Kahawaiolaa introduced himself as the current president of the Native Hawaiian Community on Hawaiian Homelands. As a representative of the native Hawaiian community he would like to move forward with geothermal becoming a meaningful resource.

Nelson Ho introduced himself and stated that he got involved with geothermal energy in 1981. That is when 500 megawatts was proposed adjacent and upwind of Hawai'i Volcanoes National Park. He is interested in learning what new developments have transpired. In the past, some of the original concerns raised involved the demand. Those issues involved the cost of bringing in a new supply of energy, the efficiency and usage, and whether the environmental and cultural subsidies were sufficient in making geothermal economical as an energy resource.

Mr. Ho explained that there were a lot of constraints on geothermal energy. Those constraints are on the record and are historical. He would like to see if any of these issues have changed throughout the years. Also, he would like to know what the Public Utilities Commission's views are regarding this resource becoming the base load energy.

Jacqui Hoover introduced herself as a representative of West Hawai'i, she is involved with the Hawai'i Leeward Planning Conference and the Hawai'i Economic Development Board. She was born and raised on Hawai'i Island. Thereafter, she attended school in California. Ms. Hoover mentioned that she was involved with the early geothermal efforts in California and would like to see what opportunities exist in order to stabilize energy use on Hawai'i Island.

Carl Caliboso introduced himself as chairman of the Public Utilities Commission. He explained that the PUC's role is to regulate public utilities. In this case, this regulation will be directed towards HELCO. He personally encourages HELCO to consider and explore existing alternative energy sources like geothermal. The consideration of expanding geothermal is very interesting. The PUC has an interest in making sure that utility service provided to the community is reliable and offers reasonable rates to the consumer. Sometimes it is necessary to make an investment in a short term to have long term benefits. This is seen a lot with other renewable energy type options and investments that are being considered and proposed. Mr. Caliboso remarked that it is also important to be sensitive to many different concerns that are deeply rooted because that is why this taskforce was established.

Jose Dizon introduced himself as the general manager for operations at HELCO. He participated at the First Natures' Futures program symposium on Friday. At that symposium, he spoke about the challenges in Hawai'i involving social, cultural, and historical issues. Although there are many issues involved, Mr. Dizon stated that he does believe there is a way to make it work.

Barry Mizuno introduced himself as a representative of the Hawai'i Economic Development Board. He disclosed that he worked for Puna Geothermal Venture and retired in 2006. At the present time, he works as a consultant for them. He stated that there are many experts that have indicated that there will be a $200 barrel of oil increase within the next 18 months. "This is scary, whether it is true or not." Hawai'i is 90 percent reliable on fossil fuel, and it is important to seriously consider other options immediately to plan for the future.

Ted Peck introduced himself as the energy administrator for the Hawai'i State Energy Office. He was also on the panel on Friday. He stated that his heart was wounded when he heard the stories of when geothermal was first introduced, and the insensitive and inappropriate way that it was put forth. As a State and as a Nation there have been many wrong doings. However, we are now on the door step of a different kind of oppression and we have an opportunity to free ourselves from that oppression. Geothermal energy working for the community, the county, and culture can have a role with future possibilities such as transportation. Mr. Peck stated that he is honored to be a part of this taskforce and looks forward to exploring this matter further.

Co-Chair Ha stated that Hawai'i can become comparatively advantageous to the rest of the world. Geothermal will elevate our economy and community to a higher place.

HELCO Presentation – Big Island Energy Overview
Presentation provided by HELCO General Manager Jose Dizon
(See Attachment A)

PGV Presentation – Geothermal Energy in Hawai'i
Presentation provided by PGV General Manager Mike Kaleikini
(See Attachment B)

Co-Chair Ha requested that someone volunteer to collect data for the cost benefit analysis report.

Mr. Mizuno stated that the report provided to the group on Assessment of Energy Reserves and Costs of Geothermal Resources in Hawai'i was created by the State of Hawai'i Department of Business, Economic Development and Tourism (DBEDT) on September 30, 2005. He asked that the members review the executive summary identifying the five geothermal rift zones on the Big Island. All five of the combined resource areas have a minimum megawatt of 488 and a combined megawatt of approximately 1396. Since the report is dated from 2005, Mr. Mizuno commented that it is necessary to receive a current projection.

Mr. Peck advised that action will be taken to discuss that matter with DLNR.

Ms. Hoover informed the group that although the report is dated in 2005, the data was collected in 2000.

Mr. Peck's assistant interjected and stated that there is no current study.

Mr. Ho recommended that a representative from DLNR attend future meetings because they designate where geothermal occurs.

Mr. Peck volunteered to meet with DLNR and provide a report at the next meeting.

ASSIGNMENT OF COMMITTEES

- Committee on Feasibility and Cost-Benefit Analysis
  - Ted Peck and Jacqui Hoover will provide a report.

- Committee on Potential Impacts of Geothermal Energy Production Expansion
  - Nelson Ho and Patrick Kahawaiolaa will provide a report.

- Committee on Electricity Transmission System Improvements and Funding.
  - Jose Dizon will provide a report.

- Committee on government accounting and community benefits packages of royalty distributions.
    - Barry Mizuno will provide a report.

FUTURE MEETINGS

The members agreed on the following:

- Tour of HELCO and PGV facilities.
- Meetings will be arranged monthly with the help of the County.
- Meetings will be open to the public.
- Meetings will be two hours.

UPCOMING AGENDA ITEMS

- Geothermal future possibilities regarding hydrogen and ammonia.

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Transcriber

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

Thursday, July 15, 2010
Hamakua Conference Room

CALL TO ORDER

The meeting was called to order by Co-Chairman's Richard Ha and Wallace Ishibashi at 2:10 p.m. Appreciation was offered to Jay Ignacio and Jose Dizon for allowing the Geothermal Energy Working Group to tour the HELCO plant prior to the meeting.

PRESENT:

Carlito Caliboso
Andrea Gill
Richard Ha, Co-Chairman
Jay Ignacio
Wallace Ishibashi, Co-Chairman
Patrick Kahawaiolaa
Robert Lindsey

GUEST SPEAKERS:

Donald Thomas, Center for the Study of Active Volcanoes
Kanoe Wilson, First Nations' Futures Program

A question was raised regarding the recent power outage on the Big Island.

Jay Ignacio explained that there was a series of generators that tripped off-line. There was approximately a 50 percent power loss on the island which resulted in a large imbalance of power. When this type of incident occurs, an Automatic under Frequency Load Shed system automatically disconnects customers in order to correct the

imbalance. This systems capability allows HELCO to control the system remotely, reestablishes the imbalance in power, and quickly restores service to customers.

GUEST SPEAKERS

Hawai'i's Geothermal Resources an Overview and History Powerpoint Presentation provided by Donald Thomas. (See Attachment "A")

Mr. Thomas explained how the island chain was formed and how all islands were derived from a planetary process called a "mantle plume." This process has been generating magma for the past 80 million years. This ultimate heat source floors Hawai'i's volcanism and it has been a long standing process. Presently, the Big Island happens to be located over the mantle plume. Kilauea volcano is over the "hotspot" and is recognized as one of the highest areas for geothermal potential. He pointed out that Kilauea actually has two rift zonesthe east rift zone and the southwest rift zone. The enormous size of the east rift zone compared to the southwest rift zone is clear evidence that much more lava has erupted from the east rift zone.

Mr. Thomas identified Hawai'i island's volcanoes and provided the members with a brief history on their location, age, activity, and subzone locations for potential geothermal energy.

Mr. Thomas mentioned that a Geothermal Technical Advisory Committee was formed in the past. Those members collected data in order to identify geological sites for geothermal. The committee became inactive and stopped meeting.
At this time, there is consideration to reactivate the committee so that they can gather additional information and reevaluate the original data. In his opinion, Mr. Thomas stated that although work conducted in the 70's and 80's were sufficient, it is necessary to obtain a geophysical survey at this time.

If an update is conducted every five years, Co-Chairman Ishibashi inquired on when was the most recent.

Mr. Thomas answered that the last update was in 2005.

Ms. Andrea Gill commented that geophysical surveys were not done at that time.

Co-Chairman Ishibashi inquired on whether the committee was reactivated.

Mr. Thomas replied that an informal proposal was sent to DLNR and he anticipates meeting with them to discuss if they are interested in reactivating the committee.

Co-Chairman Ha inquired on what kind of equipment is available now that was not available in the past.

Mr. Thomas stated that there is a technique called a magneto telluric survey. It involves an instrument that looks at natural occurring electrical signals underground.

As a potential subzone for geothermal, Mr. Kahawaiolaa asked for an estimate on how long the east rift zone's heat would remain hot.

Mr. Thomas stated that it's certain that the Big Island will eventually move off of the hot spot. However, the rate of movement is extremely slow. His estimate is that Kilauea's east rift zone will remain active for at least another half a million years, and even after that, residual heat could continue.

First Nations' Futures Program Powerpoint Presentation provided by Kanoe Wilson. (See Attachment "B, C, D")

Ms. Kanoe Wilson explained that her presentation will touch upon the cultural perspectives on geothermal energy on Hawai'i Island. She briefed the members on the First Nations' Futures Program. The First Nations' Futures Program is an international alliance between Kamehameha Schools, Stanford University, and Maori from Aotearoa (New Zealand).

Ms. Wilson stated that FNFP is a leadership-development program which is involved with various community issues. This year they are tasked with investigating geothermal energy. The key note will be to look at various perspectives out in the community and to find a way to educate and promote the broader understanding of geothermal energy on Hawai'i Island.

According to Ms. Wilson, Kamehameha Schools has identified property on the west side of the island that has a potential geothermal resource.

Ms. Wilson said that her group generated a research question that would identify goals for the project. The purpose was to identify and analyze cultural, environmental, social, economical, educational, risks and rewards on developing geothermal energy in Hawai'i. Ms. Wilson mentioned that many group members did not have knowledge of geothermal energy. Therefore, rather than research everything on geothermal energy they decided they would be meet with organizations that had the expertise in this field.

Ms. Wilson briefed the members on past resistance by the native Hawaiian community. Their concerns included:

- Religious beliefs and customs
- Cultural and subsistence customs and practices; including access
- Hawaiian cultural sites
- Protection of burials and 'iwi kupuna
- Health issues from emissions
- Transmission lines through NARS and DHHL lands
- Ceded Land exchange
- Destruction of rainforest
- Impact of pollution on native birds, fauna and flora

Ms. Wilson distributed a handout on the "Legal Ramifications for Hawaiian Subsistence Practices and Rights and a timeline on Social Process in Hawai'i.
(See Attachment "C, D")

Ms. Wilson stated what the members need to be kept in mind about the native Hawaiian community is that the environment shaped them as "a people." The environment is key and critical as part of the Hawaiian foundation. It is important to understandwhere can a Hawaiian be a Hawaiian if not "Hawai'i?"

Ms. Wilson said that native Hawaiians are concerned about having to sacrifice their religion, cultural lifestyle, and identity for the benefit of others. These concerns need to be acknowledged, respected, and addressed.

Ms. Wilson recommended that the Geothermal Energy Working Group conduct listening tours. It is necessary to meet with the native Hawaiian community and receive input from them. She encourages the GEWG to meet and "talk story" with the Kupuna Advisory Group at the Hawai'i Volcanoes National Park. They have very diverse issues and they represent various backgrounds. The group consists of educators and former park employees who can offer their valuable contribution.

Ms. Wilson in addition recommended that the GEWG include a cultural impact assessment to the Legislature with their report.

Ms. Wilson mentioned that geothermal royalties are shared between the State, OHA, and the County. She suggested that there be consideration to create a special fund for educational purposes. It is important to look at future generations who will be involved in the development of geothermal energy. Ms. Wilson informed the members that the University of Hawai'i at Hilo is preparing a proposal for an engineering program. A special fund could assist our youth by offering them an internship program in engineering. It is necessary to educate the future generation that will be one day running these facilities.

Ms. Wilson informed the GEWG that her group called "Papahuilhonua" created a website in order to provide information on geothermal and to use it as a bulletin board for upcoming events. The website address is www.papahulihonua.blogspot.com. The video from the symposium is also available on the website.

Ms. Wilson entertained questions from the Geothermal Energy Working Group.

Co-Chairman Ha stated that the Mayor directed the GEWG to meet with the community. He asked Ms. Wilson if she could suggest who the members should meet with to "talk story."

Ms. Wilson will provide the members with an outline that was developed identifying key individuals within the community.

Co-Chairman Ha commented that if Geothermal Technical Advisory Committee is reactivated and zones are identified they could meet with those specific communities to discuss the environmental and cultural aspect within that zone.

Co-Chairman Ishibashi stated that it very important to address the cultural and environmental impact in order to expand geothermal. He questioned how the GEWG should proceed with community discussions.

Ms. Wilson suggested that the members meet separately with the community associations, and also with the Kupuna Advisory group.

Mr. Kahawaiolaa recommended that the group travel to each district to meet with the each association.

Ms. Wilson named other individuals associated with her fellowship group. She will provide the members with a list of those individuals.

A member from the public inquired on how the royalties were divided.

Ms. Wilson responded that the royalty percentage is as follows:

- State – 50 percent
- County – 30 percent
- OHA – 20 percent

FUTURE MEETINGS

The members agreed on the following:

- Meetings will be scheduled through an email poll. Ms. Andrea Gill will assist.
- Committee on Scheduling Community Meetings:
  Richard Ha, Pat Kahawaiolaa, Bob Lindsey, and Jay Ignacio volunteered to be on the committee.
- A preliminary report will be completed by November 30, 2010.

UPCOMING AGENDA ITEMS

- Reports by subcommittee chairs
- Timeline on interim report

ADJOURNMENT

The meeting ended at 4:45 p.m.

SUBMITTED BY:

Kaycie A. I. Carter

KAYCIE A. I. CARTER
Staff Secretary

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Geothermal Energy Working Group
Hawai'i County Building
Hamakua Conference Room
25 Aupuni Street
Hilo, Hawai'i 96720

Minutes of Geothermal Working Group August 26, 2010

Attendees: Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Chairman Richard Ha calls the meeting to order and asks for any public statements. Kristine Kubat, a community and environmental advocate, addresses the group. She states that she intends to be a "watchdog" for the community and protect the public's interests by monitoring developments with geothermal energy operations and expansion at Puna Geothermal Venture. She also states that she suspects that there has been a lack of full-disclosure concerning past problems with PGV -- specifically, a "blowout" that occurred some years ago. She suggests that the lack of disclosure fuels suspicions in the community that the operation of the PGV electrical generation plant is dangerous to people and the environment. Finally, she admonishes the Working Group not to be an advocate for geothermal energy.

Chairman Ha advises Ms. Kubat that the Working Group is not under the sunshine law and is, therefore, not required to provide the public with access to the Working Group meetings or their findings. But, it is the Working Group's intention to keep the process open and the public is welcome to speak.

Chairman Wallace Ishibashi, Jr. thanks the speaker for her comments and asks, "How do you propose we move forward to address your concerns?" She responds that public meetings be scheduled and the community notified of the places and times. Chairman Ishibashi says that the processes the Working Group uses are still evolving, but that the speaker has valid concerns and that the community will be an important factor as the Working Group moves forward. He asks her to comment on the current conditions of the

PGV plant. She states that it has been operating for decades and appears to be safe -- that she knows of no emergencies or failures that threatened the public or the environment -- but, that there are still "a lot of suspicions" because the public doesn't know everything. She advises that there should be transparency in the process. She said that no overtly pro-geothermal information should come out of the Working Group's report. She said a community apology is needed; she proposed using the Pahoa Community Center. Also, there are rumors of the dumping of chemical toxins at PGV.

Chairman Ha asks if any other member of the public wishes to be heard. There is no response. Chairman Ha introduces Mitch Ewan who will give a presentation to the Working Group today.

James "Mitch" Ewan - ewan@hawaii.edu - Hydrogen Systems Program Manager - Hawaii Natural Energy Institute - University of Hawaii
1680 East-West Road, POST 109, Honolulu, HI 96821.
Technologist and applications specialist. Mitch had been in the hydrogen business for twenty-five years.
OFC: 808-956-2337
CELL: 832-212-6129
FAX: 808-956-2336
Presentation: Hawaii is the most petroleum-dependent state in the union. The County of Hawaii spends $1 billion per year on petroleum. By 2015 the projected cost of a barrel of oil will be over $200. Both transportation costs and business costs will be affected. However, Hawaii has sufficient renewable resources that can be developed to supply all of Hawaii's future energy needs. Big Island has 150% of resources compared to projected needs. Geothermal is the most effective, efficient, and fairly inexpensive to produce. Photo-voltaic is the most expensive to develop; wind is the least expensive. If energy is used to produce hydrogen, the outlook is especially promising.

The Clean-Energy Initiative mandates that 70% of Hawaii's energy be clean and renewable by 2030. Hawaii exports a lot of money for energy. Energy that Hawaii locally produces will keep money in the state and translate into more local jobs. Funding is available from various government agencies. For example, a public bus system for the Puna district is being developed that will use hydrogen fuel supplied by the PGV plant. US DOE is funding the buses.

Hydrogen can be produced from geothermal, wind, and biomass. 60% of municipal waste that is already collected (and whose biomass energy potential is lost when dumped) can be converted to fuel.

The GM Equinox runs on hydrogen - GM will introduce 100,000 vehicles to Hawaii as a testing site; the marine base on Oahu will be using this vehicle. Hydrogen can be used to store energy. Richard Ha asked what are the chances of bringing these cars to Big Island and Mitch Ewan said that there is a very good chance -- especially if refueling sites were in place. GM already has an office in Honolulu. Volcanoes Park diesel buses will be replaced with fuel cell buses.

The state has a $10 million fund for entrepreneurs who develop clean energy. There is a hydrogen fund. The Hawaii Center for Advanced Transportation Technologies (HCATT) was first established in 1993 as the Hawaii Electric Vehicle Demonstration Project to represent the Hawaii Consortium in the Defense Advanced Research Projects Agency's Electric and Hybrid Vehicle Technology Program. In 1999, it transitioned to the Department of Transportation's Advanced Vehicle Technology Program, and in 2001 it formed a partnership with the Air Force Advanced Power Technology Office and established the National Demonstration Center for Alternative Fuel Vehicles at Hickam Air Force Base in Honolulu. HCATT will be doing the Volcanoes Park bus-engine conversion and works with the USAF. Clear Fuels is a fuel company that develops hydrogen fuel through conversion of biomass.

Mitch Ewan is an advocate of the community-sized conversion plants, rather than large-sized mega-conversion fuel plants. Fuel facilities already exist on Oahu with plans for new construction. Big Island has a small wind-turbine automated plant to produce hydrogen that can be controlled over the Internet on the Kahua Ranch. Took a year to develop but works well.

HNEI will provide hydrogen to Volcanoes National Park for the fuel-cell buses. HNEI uses an electrolyzer. Park Services is working to get the approvals. $1.2 million funding from DOE. $1.2 million from State of Hawaii. 2 million visitors to the park will learn of the project. Target date: January 12. Hydrogen station is built and will soon be shipped to Hawaii. The movie theater and visitors center will be powered by hydrogen. Big Island can be ringed by hydrogen fueling stations and shuttle buses can provide a feeder service from people's homes in Puna to hydrogen-powered buses that will operate throughout the county.

Hydrogen will be used also as an energy storage system -- to take the extra PGV electricity for hydrogen conversion to be stored. Fertilizer is a by-product of the conversion and reduces agricultural costs. Fish farms can use the oxygen from electrolysis.

The Hawaii grid is at maximum for metered renewable energy since a petroleum generator must be in standby mode due to vagaries of wind and sun. A large electrolyzer can meet the power fluctuations in the grid while it is producing hydrogen and oxygen. Ammonia is a safe way to store the hydrogen and transport throughout the islands.

Question from audience: How large a roadblock is permit processing from the government?
Answer: If the power is produced for sale, rather than exclusively for the grid, permits would not be required.

The electrolyzer produces hydrogen and oxygen; nitrogen from the air can be combined to produce ammonia (NH3). 12,000 kWh can be produced for each ton NH3. 30

kilograms of hydrogen is equivalent to 30 gallons of gasoline. GM cars have a range of 150 miles on one tank of fuel.

Tube trailers (gas cylinders on trailers with safety features) dispense fuel and can be used as mobile stations. After proof of the concept is accepted the smaller electrolyzers will be replaced by larger as the operation becomes financially viable.

Question from Working Group: How much does it cost to run the fuel-cell bus system; is it sustainable or is funding required?
Answer from Mitch: Initially, subsidy funding will keep the project viable; an analysis of the trial-phase of the demonstration project will illuminate the hidden expenses. The geothermal-plant electricity will keep the greatest expense -- process electricity -- at a minimum. That fact attracted the DOE's interest in funding the demo project.

Question from Working Group: What is the cost for the electricity for the system already in operation?
Answer from Mitch: It is about 23 or 25 cents per kilowatt-hour on Oahu; we haven't negotiated a price with PGV, but we expect it to be about 5 to 7 cents per kilowatt-hour.

The reason the national park is being used is because there are vehicles there that the park service wanted converted, not because it is federal money funding the project. The reason the GM cars are on the military base on Oahu is because the the vehicles are prototypes and very expensive. The portable fueling stations are intended to be towed by hydrogen-powered trucks. The technology to store and transport the hydrogen fuel exists and is used everyday in many places on the mainland. The low-pressure systems are safe and inexpensive. Similar systems can transport fertilizer to farms and fuel to transfer stations.

Mitch showed slides of the GM hydrogen vehicles. Initially, the US Army is getting five, the US Navy is getting five and the US Air Force is getting five. Eventually, thousands of the vehicles will appear on the islands as GM rolls out the models for testing in Hawaii.

Several government and non-government entities can contribute tax money and grant money to the projects and need to be approached as soon as possible with requests for funding. When it transitions to a profitable commercial operation then local businesses will have an interest in backing the projects.

Question from the audience: What's the conversion cost between hydrogen and gasoline? Would car-rental companies be interested in using the fuel-cell cars in their rental fleets?
Answer from Mitch: It takes 60 kilowatt-hours to produce a kilogram of hydrogen - so, depending upon the cost of electricity, it can be competitive with gasoline, especially with a fuel-cell vehicle as opposed to a hydrogen gas vehicle. As the price of petroleum rises, the hydrogen fuel becomes more competitive and businesses can be certain what their fuel costs will be, rather than being at the mercy of foreign markets.

Question from the Working Group: How long before there are commercial quantities of hydrogen being produced?
Answer from Mitch: I'd give it the five-year window depending upon funding. A commercial electrolyzer can kick out a lot of hydrogen, but they are expensive - on the order of $2 million. In one year the parks buses will be working. Until the general public buys hydrogen cars or converts their cars, the fueling stations will be available, but under used.

Question from the Working Group: Can you explain how the hydrogen fuel-cell works.
Answer from Mitch: It is similar to a battery design; there are two gases, hydrogen and air, separated by thin plates that allow interaction with one another aided by a catalyst. In the process of combining together they create electricity. The electricity is used to power an electric motor.

Question from the Working Group: Do you anticipate that the fuel-cell car will replace the battery car?
Answer from Mitch: No, both technologies will coexist and improve over time. The fuel-cell works like a hybrid.

=========

After the presentation, the Working Group discusses the minutes from previous meetings, makes required changes, and formally approves the minutes. Richard Ha introduces administrative volunteer, Christopher Mann. Working Group discusses Sen. Kokubun's recommendations concerning what form the Legislative Interim Report should take. Chairman invites volunteer to discuss mechanics of compiling data and shaping the report through email and email attachments. The volunteer will act as editor and return the material to the Working Group so that all members can see the text of others and the progress of the overall document.

Nelson Ho suggests the Working Group determine the specific and substantive issues for the foundation of the report. Jay Ignacio asks the administrative volunteer to clarify how he will be assisting the Working Group.

Wallace Ishibashi recommends that all the sub-committees submit their text to the administrative volunteer who will put the material into an agreed-upon format and then distribute that to all the members of the Working Group.

Nelson Ho suggests that to start, an objective set of bullet points would give direction to the writers, who would then offer their own expectations and bring their own expertise to the project. Nelson Ho suggests the report include energy resources that credibly compete with geothermal.

Jay Ignacio states that the Working Group needs to know what specific writing assignments each member has.

Wallace Ishibashi recommends that the administrative volunteer create a list of writing assignments and provide that list to Richard Ha.

The administrative volunteer offers Richard Ha a list that is a synthesis of statements from SCR 99 that can be used as bullet points to make writing assignments. The Working Group agrees to continue the meeting and make the writing assignments from this list and some additional considerations.

Patrick Kahawaiola'a states that although public perception may be mixed learning that Jay Ignacio sits on the Working Group - as if HELCO might have undue influence -- nevertheless, the group needs his expertise to make the best recommendations to the legislature. Patrick Kahawaiola'a inquires that, since it is HELCO's position that further expansion of the electrical grid will not include petroleum-based generators, will geothermal be the number one alternative or will other types of electrical energy generators will be used?

Jay Ignacio states that given the practical considerations of increasing demand, design dependability, and past history, at this time it would be unwise to depend entirely upon geothermal plants for the island's energy needs. A statistical analysis of probabilities will likely tend toward a mix of alternatives and fossil-fuel generators. The utility and prudence of keeping fossil-fuel energy available to the grid represent the most reasonable approach.

Barry Mizuno opines that demand for energy of all sorts, transportation as well as electrical house power, will doubtless increase. Accepting that fact, Hawaii is best served by developing resources that are available locally rather than depending on resources that the island doesn't have.

Nelson Ho and Patrick Kahawaiola'a agree that it would be helpful if Jay Ignacio could provide specific energy-demand projections and potential resources to meet those needs so that they could approach communities that would be affected by construction of power plants, present the facts and ascertain public reaction.

Richard Ha states that there have been changes to conservation land rules and changes to sub zone protections that the Working Group needs to be aware of.

Patrick Kahawaiola'a states that if all the geothermal plants are scheduled for construction on protected lands, everyone might as well go home.

William P. Kenoi
Mayor

Walter K.M. Lau
Deputy Managing Director

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Hilo, Hawai'i 96720

Minutes of Geothermal Working Group October 11, 2010

Present: Andrea T. Gill, Ted Peck, David Matise for Carlito P. Caliboso, Patrick Kahawaiola'a, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

Guest Speakers:
Patricia Brandt, IDG CEO/Board of Directors
Mililani Trask, Indigenous Consultants
Roberta Cabral, IDG Senior Advisor
Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

John Olsen, a member of the Puna community: John Olsen is not representing the Sierra Club at this meeting. He states that for 20 years he has experienced trouble. People are making a political decision rather than scientific or economic-based decision. He is very familiar with the development of geothermal energy. Mr Olsen expresses concerns that decisions based not on costs or accurate projections. Cost / Benefit - information has not been shared. Quotes the MIT Chair of Energy and offers a handout of the professor's opinion that Solar Energy is the best choice.

Steve Dearing, project manager for Kealoha Energy - filling in for the designated speaker, Ms. Kuulei Springer, who could not attend today - developing a 25 to 30 MW facility to replace the oil-burning plant in Hilo. The late James Kealoha was founder of the company. Cost is $3 million per MW. Proposes a $90 million plant for Puna. Time to become self-sufficient and

cease the oil-based energy power system. He advocates geothermal as part of non-fossil grid generation. 89 acres already designated for geothermal and ready to drill test wells. Rates on Hawaii are higher than on mainland. Proposes Kealoha Energy will cut electrical rates and create jobs. Local residents can be hired to work for Kealoha Energy. Many companies are ready to do the construction. Property will be leased to operator for percentage of profits. Asks for Working Group's support to have Kealoha Energy provide clean and reliable energy. Co-Chair Richard Ha invited the company to make a formal presentation to the Working Group. Mr. Dearing states that paying 35 cents per kilowatt hour "is obscene." Geothermal Developments is a small company, but will partner with larger groups to get the job done: possible growth to 70 MW. Contact and information at: kealohatrust.com.

Member Nelson Ho. stated it was the first time he was aware of another geothermal proposal in Lower Puna and concurred with Chair Ha in requesting that Kealoha Trust and Ms. Springer be formally invited to make a presentation.

Mr. Dearing states that he has not been able to get through to the Working Group. He is not a fan of the Sierra Club. He was offended that his presentation was not warmly accepted. ORMAT has held up the Kealoha development for 17 years.

Moani Akaka: Was in a photograph when the geothermal well had a caustic blowout in early days. Has reservations about geothermal. However, if it is to be done, it must be done properly to avoid the problems of the past. Local community was adversely affected by failings of the first plant. Says geothermal should be owned by local population and benefits provided to local population. The geothermal price should not be the same as oil-based electricity. Hawaii should not be industrialized like Pittsburg; ORMAT is obsolete - 3 decades without benefit. Working group must prove that geothermal is safe. Insulted that anyone would demean the Sierra Club, who protect the aina.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: hopes for success of the working group, however, the group seems to advocate PGV to the exclusion of alternatives, like an addict to replace fossil fuel with geothermal injected into the same system. Other ways could be available, direct-use applications, jars sterilized for food sold at farmers markets, for example. Small-scale technologies are a potential. If oil runs out, H2 generation from excess PGV production is a good idea, but for community, not just tourists. Mitch Ewan's idea to develop hydrogen buses was initially for tourists - not the plan has grown to include community transportation. Compressed air may be superior to hydrogen. Danger is alliances that are formed between existing groups to protect the status quo - others need to be represented and future generations must benefit, also. Think ahead and progress is possible.

Co-chair, Wally Ishibashi states: this is not a PGV committee and that the Working Group is willing to listen to all voices and alternatives.

Member, Ted Peck states that Mitch Ewan is under contract with the Energy Administrator to fulfill the Hydrogen Fund.

Member, Patrick Kahawaiola'a advocates going to communities to receive the public's energy concerns - anyone willing to schedule a meeting, please do so. The host culture should benefit from developments and improvements in the state.

Moani Akaka: Office of Hawaii Affairs receives revenues from ORMAT - the Puna community should benefit more and that benefit should be visible.

Co-chair, Richard Ha: attended Peak Oil Conference in Washington, DC. Reads from website. Platts News Service is a leader in providing energy-related news regarding energy price assessment. A panel of geologists and energy analysts debated Thursday the severity and timing of an anticipated oil crisis, with one saying during a Washington briefing that crude oil production has now peaked.

"The global rate of production of oil is peaking now,"said Tad Patzek, professor and chairman of the department of petroleum engineering at the University of Texas - Austin. "The size of accumulation [of oil] is not equated to the rate of production," he said. Frank Rusco, an energy director at the US Government Accountability Office, estimated some 45 years of "proven reserves," though current and future oil demand will stress supplies.

"Higher oil prices can retard economic growth and even cause a recession in the right circumstance," Rusco said at the briefing, which was organized by the Association for the Study of Peak Oil and Gas. He declined to say after the briefing what a gasoline price ceiling might be for US consumers. "The remaining hydrocarbons will be more costly to get from underground," from a "policy perspective," Rusco said, citing the Middle East as a "fairly unstable" region.

Robert Hirsch, an energy adviser at MISI and former manager of Exxon's synthetic fuels research laboratory, put the state of looming shortages in more dire terms, saying "in the next two to five years oil shortages will get deeper and deeper." Meanwhile, "mitigation of oil dependency by transitioning into other energy sources will take upward of a decade to come into play. "Sometime after a decade, mitigation will take impact and things will start to flatten out," Hirsch said.

New reserves from Brazil and production from unconventional sources in the US will not be enough to compensate for depleting reserves, panelists said. The Ghawar oil field in Saudi Arabia, still a bright light in the petroleum world, could see a sharp and imminent decline in production, Patzek said. If Ghawar "peters out, to replace it [with production elsewhere] will be a very difficult task," he added. He estimated Ghawar's current production at between 4.5 million and 5 million barrels per day, though added that actual production figures are unknown as they are a "top secret."

Later, on the sidelines, Patzek said Ghawar could become the region's Cantarell, referring to Mexico's offshore oil field that has seen production plummet by over half from a peak 2.1 million barrels per day in the mid-2000s. Patzek said that the ongoing water-flood efforts into the Ghawar field to stimulate production will eventually taper off. "You're injecting twice as much water into the well," he said. "Your field is watering out," Patzek said in an interview

Patzek told the briefing that Norway's reserves have peaked, while he characterized the decline rate in the US Gulf of Mexico as "very high." BP's Thunder Horse well in the Gulf "has not reached its potential and it's declining faster than people thought," Patzek said. A BP spokesman was not immediately available for comment on Patzek's remarks about Thunder Horse.

A looming collapse in credit markets and liquidity could lead to wildly gyrating prices for crude oil within the next five years, with prices falling to $20 per barrel, then possibly rocketing to $500 per barrel, a peak-oil theorist and commentator told the Association for the Study of Peak Oil and Gas conference. "This is not a recovery that we're in," said Nicole Foss, a former fellow at the Oxford Institute for Energy Studies, who predicted "chaos" in foreign currency and equity markets within years. A severe deflationary plunge will contribute to a liquidity crisis among the financial sector, Foss said on a peak oil panel late last week. The meeting in Washington wrapped up Saturday.

"Oil will bottom early in this depression," Foss said. She and fellow panelist, energy analyst, Chris Martenson, predicted that foreign currency markets will become more volatile, with domino effects on global money supply. "It's not unthinkable the the US will have another financial crisis," Martenson said, adding that he gave the US a "50%" shot at having a fiscal crisis and a "50%" chance of experiencing a currency crisis. "We're going to see severe dislocations in the foreign exchange markets."

Deflation is tomorrow's problem," Foss said, adding that a lack of purchasing power will undermine price support for crude oil. Then "printing [money] is a few years off," she said. "We could see $20 per barrel and then $500 per barrel within the space of five years," Foss said. Foss runs the Agri-Energy Producers' Association of Ontario, where she has focused on farm-based bio-gas projects and grid connections for renewable energy. At Oxford, she researched electricity policy at the EU level, according to her website. She was previously editor of the Oil Drum Canada, where she wrote about peak oil and finance.

Speaking on the sidelines of the conference, Foss said that natural gas holds no promise as a safe hydrocarbon haven in a scenario of volatile crude oil prices. There is a "perception of a glut" of natural gas reserves and other resources from new shale plays and coal-bed methane and tight formation gas Foss said. "I would argue that this is an illusion," Foss said. The environmental cost of extracting unconventional resources "is tremendous," Foss said, adding that the energy resource "bang for buck" is unappealing. "We'll end up with natural gas price spikes, "after years of low natural gas prices," she said.

As demand out paces supply, the urgency to do something to anticipate the crisis becomes greater. Hope replaces shock if we agree that we can figure out ways to help fend off the panic 2 to 5 years away from oil spike - lowest economic group will suffer the most when prices rise. An analysis of $200 per barrel oil, even without great detail, it would be devastating to the Hawaiian economy.

To compare: 35 acres of geothermal equates to 35,000 acres for bio-mass -- 7 cents per pound if farmer were to grow bio-mass without subsidies -- it would never happen.

Member Nelson Ho suggests to discuss these matters later on in the agenda to permit presentations would be more appropriate.

Presentation by Innovations Development Group - Patricia Brandt, CEO/Board of Directors, Mililani Trask, Indigenous Community Advisor, Roberta Cabral, Senior Advisor. Office email: info@idghawaii.com.
Michele, Staff Assistant. Ryan Matsumoto.

IDG has 10 years experience with geothermal and represented the Maori of New Zealand in three energy-development projects. The overarching approach is to respect human rights while developing energy resources: Native-to-Native process. IDG is an Hawaii-based strategic planning company that is focused on renewable energy development. IDG wants Hawaiians to control their own resources. In New Zealand, the Maori Queen and IDG developed plans to coordinate contacts with the experts to develop locally-owned resources. Equal representation is the key to a successful geothermal drilling. Improvements in technology are required to avoid toxic venting of gases, adverse impacts to the environment, and to provide for the general benefit of the community. IDG provide expertise choosing the best project, the right developer, and training for local people.

Mililani Trask presented an outline of the Native-to-Native model -- recognize human rights of homeland to benefit from development. Must address climate change and renewable resources. Old model of resource exploitation is outmoded. UN declaration for human rights is the foundation to the development model - preserve cultural heritage - environmental sustainability - socially responsible. Hawaii most at risk for shortage of fuel due to dependency on energy - Hawaii County is the largest landmass in US capable of being energy self-sufficient. Development of firm-power geothermal needs tax incentives - policy needed that recognizes geothermal is primary resource of ceded land trust. Carbon footprint shared by all who drive and use energy. Geothermal development requires a community collaborative model - equitable sharing of resources. How do Hawaii Renewable Energy Development Venture describe stakeholders? It shows who you are dealing with. Mostly corporate members are stakeholder. No local representation. Need cultural affiliations - equitable and fair - need to comply with legislation. Ignoring cultural considerations led to court proceedings. Also, it was cheap and filthy technology that led to geothermal blowouts 20 years ago. Need appropriate technologies for Hawaii's conditions. Environmental issues need to be addressed at the planning stage. Hawaii paying the highest rates for electricity in the country due to lack of participation in negotiations at early stages.

Pele Defense Case set standards - deviated bore (drilling at an angle) provides access to resources that lie beneath environmentally-sensitive areas. Community involvement needs to move first.

Three Economic Models: 1) ORMAT type is Build-Own-Operate and transfer of benefits years later 2) Royalties are pennies on the dollar - not equity benefits - fixed fees per MW 3) Equity owners at all levels are invited to sit at the table. Participation means shared income.

Roberta Cabral - The general public and native interests are vested in indigenous mineral and geothermal is a mineral. Initial investment in research is critical for later negotiations with investors and developers. The negotiation model leverages community, investors, and developers interests. Need to partner with bonafide geothermal developers. IDG proactively seeks support of local population with Community Collaborative Model. IDG specializes in community connections as well as understanding that geothermal shall not be the exclusive resource - but, an important resource. Risk is capable of being measured - that relates to the cost of capital - Collaborative Model structures a PPA (Power Purchase Agreement) with percentage of surplus cash dedicated to the developer and share a percentage of the proceeds in a community trust. IDG provides protection for developers by paving the way for community partnership. The community receives benefit from the trust.

Member, Ted Peck states that there is some question as to whether or not the PUC would approve this type of trust with money going into it. The legislature must set policy for this type of model - community equity - change in model now - cannot undo what contract-in-place stipulates under Hawaii's constitution.

Roberta Cabral - money from project to community can be used for stewardship; trust fund goes to community's benefit: parks, businesses, educational scholarships, farming, fish tanks, fish drying, spas, etc. Technical and financial partners chosen by IDG, who assume risk. IDG strategy is to bridge the gap between community and developers. IDG thinks geothermal is the way to go.
IDG wants to be selected as a preferred geothermal developer. IDG has the experience and the expertise to do the deals.

John Olsen, a member of the Puna community, states that actually it is the community that takes all the risks - money is just paper. The evacuations of Puna residents due to venting demonstrated that fact.

Member, Nelson Ho requests a copy of the IDG presentation to be reviewed in detail by the committee.

Co-chair, Richard Ha, suggests IDG create a proposal for legislators.

Member, Jay Ignacio states - need to balance disclosure to legislation and proprietary information of IDG's. Since SCR99 directs the Working Group to report on establishing a community-benefits package, IDG's model may fulfill that requirement.

Member, Ted Peck states that the community-equity model needs to be articulated and some statutory language may be the starting point.

Presentation by Guy Toyama, Executive Director - Natural Energy Laboratory of Hawaii - guy@EnergyFutureHawaii.org
Speaking about the NH3 Energy Conference in Detroit.
NH3 is ammonia and the point of the conference is to demonstrate that ammonia is a good way to carry energy. Geothermal is a good way to create ammonia. Expansion of geothermal

must occur first - before secondary industries can be established. Farmers need fertilizer to get nitrogen into the soil. Ground transportation is the single largest use of fossil-fuel energy, so load varies with tourism in Hawaii. Geothermal can be used for ground transportation, as well.

Off-peak hours, curtailment which could mean waste (with fossil burning) or production if used to convert water to H2. Electrolyzers are used. H2 can be used to fuel transportation, but H2 vehicles don't represent a very large part of the transportation system. So, at 2008 Conference, the speaker, Richard Ha, asked Guy about converting H2 to ammonia. HNEI slide - ammonia is the practical man's hydrogen. Synthetic Urea (a dry form of ammonia fertilizer) accounts for 3.6 tons of NH3 per day on island farms. If geothermal were expanded to 720 MW it would create enough gasoline-equivalent can provide fuel for all autos on Big Island. The Dept of Energy with matching state funds have a pilot project to build and maintain 2 hydrogen fuel buses.

Member, Ted Peck states meeting with Mayor today and discuss feasibility of transforming all county buses to H2 and what is timeline.

General Motors and fuel companies are introducing Project Driveway - vehicles that use H2 and an infrastructure to support it.

Ammonia is a good way to move energy. Ammonia to Oahu for power instead of the expensive power line. Ammonia is denser with hydrogen than liquid hydrogen. Ammonia could be an exportable commodity. The energy conference demonstrated many different research designs that used ammonia as the fuel source. Renewable Hydrogen Network - Japanese graphic of renewable ammonia combined with H2 and O2 for best fuel. Injection of water into ammonia improves fuel characteristics.

Member, Ted Peck asks about the capital investment for ammonia plant - Guy Toyama will provide the report. Mr. Peck needs to leave for another meeting.

-- Ten-minute recess --

Co-chair, Richard Ha: Call back to order

Working Group Members discuss the Geothermal Interim Report for Hawaiian Legislation - Format and content

Member, Nelson Ho states some concerns: that the working group is not ready to answer / address all aspects of the information required for the legislation 1) revenue sharing - especially for the least represented 2) impacts to PGV neighbors: air quality / noise 3) DNLR's role in process 4) regulatory agencies' input 5) all forms of energy have subsidies - stated or not - need scientific information regarding expansion of PGV's present capability.

Co-chair, Richard Ha: Need to discover from Working Group Member, Bob Lindsey - where does the money go - what benefits?

Co-chair, Richard Ha asks Working Group Member (HELCO), Jay Ignacio, what needs to happen to take the next step?

Member Jay Ignacio says a Resource Plan will address what mix of resources will be used going forward. Clean Energy Scenario Planning (undefined at present) - Identify the resources, location dependent, stability is essential. HELCO will produce a study, but not the official public utility plan, outlining the integration of resources. The essential requirement is to move from high-level discussion to defining the specific resources and their particular locations and capabilities. Geothermal is an option, but without certainty of investment, developers won't begin building and without existing facilities, HELCO cannot plan assuredly to integrate into the grid.

Member, Andrea Gill: Needed are detailed resource assessments defining the scope of available energy and how it can be developed. There can be no absolute certainty about a resource. Only drilling and actual steam production will verify - so need to find the level of comfort in planning using exploration data to project future growth and integration of new power plants. Also, Kealoha Energy's plan is more preliminary than has been asserted.

Member, Jay Ignacio says that working with researchers to identify high-probability resource locations is a first step, the determine how development will be funded.

Member, Nelson Ho: Regarding baseload growth of power production, what is the recommendation according to HELCO's last completed plan? What estimate did HELCO make in terms of baseload growth in MWs? What's the preferred type of plant?

Member, Jay Ignacio: Theoretically, all fossil-fuel power plants could be replaced. If the resource is viable and a benefit to HELCO's customers, the PUC would approve a change to geothermal plants. Last filing of projections predicted a 2010 need above 200MWs peak. Presently, peak is about 185MW. That means the plan for bringing on a firm, large-capacity generator in 2020 can be pushed further, since demand has not reached projected growth. On-site generation and the economic downturn altered the growth in demand. In 2022 or 2023 there is a plan to bring on another geothermal plant, but not sure how it will come about. The preferred type of plant meets the needs of the customer: reliable, low cost, and no adverse impact on the environment.

Member, Andrea Gill: Can HELCO's contract with Hamakua Energy be displaced with expanded geothermal?

Member, Jay Ignacio says HELCO has a thirty-year contract with Hamakua Energy that goes out to 2030. They are compensated in two ways: 1) for being available - capacity and 2) for the energy HELCO uses.

Member, Patrick Kahawaiola'a asks if geothermal at PGV is producing at capacity and if HELCO is buying all power produced. What resources can provide electrical system stability in addition to fossil-fuel plants?

Member, Jay Ignacio says HELCO curtails purchase of power from PGV at night. Shows a graph of the electrical load profile. As demand decreases, certain plants can be curtailed. Oil-fueled steam plants cannot be taken off-line without rendering the system unstable. New designs of geothermal will have the reliability required to ensure stability to the grid, but the current design at PGV does not and, hence, cannot dependably and safely displace the oil-fueled plants. But, in parallel with exploring alternative energy resources, HELCO is exploring alternative fuels. Bio-mass may not be the answer, due to economic constraints, but alternative fuel sources are an option.

Kristine Kubat asks Jay Ignacio if HELCO sees itself as a developer of alternate energy and alternate energy resources?

Member, Jay Ignacio states that HELCO is flexible in the matter of bringing new resources to the system. The utility has the burden of providing service. An independent provider does not have an equivalent responsibility. If HELCO retires its plants and is no longer financially viable, it cannot provide the service as mandated by the public.

Member, Nelson Ho says it is the nature of geothermal that it cannot be throttled back to match demand, the steam is thrown back into the earth and wasted.

Member, Jay Ignacio says that using geothermal energy independent of the electrical power grid would permit more geothermal to be developed effectively and, for example, electrical transportation would provide that use. Nevertheless, geothermal's short-comings have to do with the technical/engineering side and the geophysical limitations of the resource.

Member, Nelson Ho says that the geophysical limitations are what John Olsen and Sierra Club have been pointing to all along. The resource is about pinpointing discrete water and rock formations that have desirable characteristics and that operation is problematic has a great deal of risk and uncertainty associated with it.

Member, Jay Ignacio says that the trouble is often the extraction; wells get clogged and can no longer produce, so other wells have to be drilled to replace them.

Co-chair Richard Ha asks if it is about the return on investment - if enough wells are profitable and productive, the systems works well. It is about managing the resource.

Member, Nelson Ho says that if the relevant problems are defined in the Interim Report, the group will be on its way to providing information to help solve the problems.

Member, Jay Ignacio says the problems with accepting photo-voltaic energy and the contracts that exist with wind could mean that later contracts are turned away before older commitments. So, even if geothermal proved to be less expensive, HELCO might be prevented from buying it.

Member, Patrick Kahawaiola'a says people outside of the working group don't understand that part -- and need to be told. If geothermal will be available at 6 cents per kilowatt, but HELCO has to pay 35 cents for wind because of an oil price spike, people will be confused and angry.

Co-chair Richard Ha says that the inter-island power connection starts to make practical sense - especially, as resources costs rise.

Member, Andrea Gill asks, is HELCO paying 15 cents avoided-costs for wind regardless if it is firm or intermittent?

Member, Jay Ignacio says, Yes. Contract exists for a long time. If we don't take aggressive steps to expand geothermal, especially if oil prices go to $200 per barrel, there will be problems supplying energy to meet demand. It will take time to prove reliability and come to be a dependable part of the system. It is at least a year to bring a plant online. How well that source will be managed is fundamental to the level of confidence. Plants cannot be retired until there is demonstrated reliability and a redundancy in case of problems. Propose that HELCO runs two simulations to provide data on how transmission expansion scenarios would play out.

Member, Andrea Gill says new resource data is needed to remove uncertainty regarding growth and stability. Landowners can request to be in a subzone or removed from a subzone if it appears a resource is there. Need to work through the DNLR. The DNLR can create a committee as it did before. Currently outlining the issues for the Interim Report.

Next meeting have a draft of report to look at. Propose November 8, 2010 as date for next meeting.

William P. Kenoi
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Minutes of Geothermal Working Group November 8, 2010

Present: Robert Lindsey, Ted Peck, Carlito Caliboso, Jay Ignacio, Nelson Ho, Barry Mizuno, Wallace Ishibashi, Jr., Richard Ha

Recorder: Kaycie Carter

CALL TO ORDER

Co-chairman, Richard Ha: Invites comments from the public.

Kristine Kubat, a community and environmental advocate <kristinekubat@gmail.com> 808 934-8482: states that she has read the Working Group Interim Report draft and objects to the optimistic language regarding geothermal. Petroleum analysis is plentiful, but there is limited analysis for geothermal. Despite the fact that Big Island is located above a geothermal hotspot, the resource available for geothermal may be depleted. In her estimation, geothermal is not a renewable resource. She says that the report should so state. She objected to the statement: a resident could have their property removed as a subzone designated for geothermal if the resident so desired. The petition is difficult for people to do. Also, she asks for facts about HELCO plans to retire oil-fired generators. Also, she asks PGV to come forward with facts. How much does it cost to build a geothermal plant. The concept of firm-power for baseload needs to change. Depletion, firm-power, geothermal resource subzones all need to be defined clearly. She wants to make some recommendations in the final report.

Jon Olsen, a member of the community, says he and 87 others withdrew their properties from the designated geothermal subzones. The state did not respond favorably to their certified letter. He has copies of legal filings and he will provide when necessary. He expresses his concern that the current evacuation zone around PGV hasn't been discussed.

The EPA requested that the state and county create a notification program and that has not occurred. There is a concern about heavy metals and sulfur being released into the environment around PGV. He believes every chemical is within seawater, many are dangerous, and the geothermal plant wells may release them.

Steve Phillips, a member of the Puna community, had a bad experience with geothermal before. He said that the law should be changed to permit a contested case hearing. Any new development that impacts the community must uphold the rights of those in the neighborhood. He stated that geothermal gases poisoned his son in his crib. He stated that he lost his marriage because of geothermal. His property values went down because of geothermal. He said he wrote rules for a geothermal asset fund that were never used. How will the mess of a decommissioned plant be funded when it needs to be dismantled? That is what the asset fund is for. He will do everything in his power to halt geothermal development unless the community has a contested case hearing. The community led to improvements over the poorly designed and built experimental well.

Robert Petricci lived in the neighborhood during the development of geothermal and was evacuated years ago when there was an open venting. He also wants a contested case hearing. There will be problems if geothermal is built where people live. Also, geothermal developers must not cut corners during construction.

Member Robert Lindsey says he thinks a contested case hearing is a good idea and fits in with SCR 99. To move forward with geothermal means that we must contend with some of the past errors.

Co-chair Wally Ishibashi says everyone knows some things were done wrong in the beginning, but we are moving in the right direction now. Everyone wants things to be done correctly. We are trying to do the best we can.

Member Nelson Ho says the legislature took away the contested case hearing and that the Working Group can make a recommendation.

Member Carlito Caliboso says that the Interim Report should focus on the issues directly related to SCR 99.

Member Ted Peck says since it is the Interim Report, we don't need all the answers.

Co-chair Ha asks if anyone has suggestions on how the report should go.

Member Carlito Caliboso reiterates that the report should only address the points expressed in SCR 99.

Member Ted Peck says the report can tell the legislators: here are the answers to these problems and here are the issues we need to track down. Also, the Executive Summary needs to be really tight.

Co-chair Ha invites the volunteer editor to the working group table to receive point-by-point instructions and edits of the report draft from the working group members. Appendices can

be used for bulk information and details referenced in text. Also, PDF files permit members to make comments on the text. A discussion of the executive summary ensues regarding key points and the possibilities of disagreements and unresolved issues. The members resolve to work on the Interim Report via email. There is a need to assess resources specifically. Need discussion of geothermal electricity potential, but also secondary industries, such as hydrogen and ammonia production. The scope of the resolution forms the basis of the contents of the report and the over-arching analysis of baseload feasibility. However, there is a need for context regarding peak oil and other considerations that provide the basis for the working group's recommendations to the legislators.

Member Nelson Ho states that the report should be lean and cut-to-the-chase rather than offer too much information. The information needs to be clearly stated. Since the environmental impact is site specific, there can be no information on the impact without identifying the location of the resource or how it will be developed.

Member Barry Mizuno agrees that the most critical issue should be to identify the resources available. More testing is needed.

Member Ted Peck points out the shortcomings of available data on geothermal. Report needs to discuss issues as well as upside.

Members Ted Peck and Nelson Ho discuss the pros and cons of mediation versus contested case hearing with the community members.

Co-chair Richard Ha discloses his discussions with a development group who are investigating the possibility of developing geothermal on Big Island. He has not joined with them and will keep the working group aware of his role, if any.

Members Nelson Ho and Barry Mizuno discuss the role of geothermal in the future and the need for geophysical data.

General discussion of format and structure of next draft using printout of existing draft among Working Group members and volunteer editor. The consensus is to build the report so that it is concise and focused on the SCR 99 mandates. Circulate the next draft in three sections: Executive Summary, Working Group writing assignments, and Appendices. Start with addressing using geothermal as primary energy resource as the Working Group conclusion and the additional uses (transportation and ammonia production) as secondary benefits.

Member Carlito Caliboso states that there may be a conflict if he supports geothermal uses before the legislation and is later asked to decide on geothermal development with the PUC.

Member Ted Peck states that even if members must recuse themselves from advocating for specific development, it is appropriate for the Working Group to assert its principal findings: that multiple geothermal plants are the most prudent approach, that historically geothermal is a lower-cost energy resource, it has the potential to supply baseload electricity, although it has not yet demonstrated baseload consistency in its application in Hawaii. It is a renewable resource indigenous to Big Island and can neutralize the price volatility of petroleum fuel for the county both in terms of the electrical grid and in terms of transportation. Additionally,

products that assist in island agriculture can be cost-effectively produced with geothermal and replace the importation of products made on the mainland from fossil fuels. Thus, it has a significant potential to be Big Island's primary energy resource.

Member Jay Ignacio advises that reliability is essential to satisfy the utility's need for dispatchable energy on demand.

Member Barry Mizuno suggests that if other geothermal plants were in operation and each one of three produced the mega wattage for the grid as well as electricity to create other products and services, than the combination of generation beyond the grid's requirements would permit reliability so that, if needed, one or more could serve in another's place.

Member Ted Peck states that a robust environmental impact statement can mitigate community concerns. A general discussion concludes that the contested case hearing be explored, but not recommended to the legislation at this time.

Member Jay Ignacio cannot speak to the intricacies of specific expansion of the HELCO grid, since that requires detailed study. However, he proposes a HELCO-funded, high-level study to look at a hypothetical expansion in two locations.

Member Ted Peck states that funding would be necessary to fully analyze the impact of a transition to geothermal. For example, shippers and dock workers may loose work importing supplies for petroleum-based plants. It is generally concurred that funding is needed and that the Working Group should recommend the legislation make it available.

Co-chair Wallace Ishibashi points out that there are two projects the Working Group recommends be funded: first, testing and identifying specific locations that hold promise to be geothermal generation sites and second, analyzing the impact of transition to geothermal upon the existing infrastructure. Resource analysis and impact assessment.

Community benefits discussion concerning the best approach and advisors to consult. Community benefits can include Volcanoes National Park hydrogen buses and agricultural fertilizer.

Member Robert Lindsey identifies the resources and people who will be supplying information for the community benefits section. Recommend to the legislation that royalties from geothermal be identified and ear-marked for local community benefits rather than going into the general fund.

Co-chair Wallace Ishibashi asks about royalties calculation and distribution. The legislation will have to address the percentage distribution when it comes up.

Member Barry Mizuno explains that the royalty is calculated according to the value of the resource using a formula developed by DNLR and the US Department of Interior; from that figure, 10 percent of the resource value is designated royalty.

Member Nelson Ho asks Richard Ha about IDG and the consortium who wants to develop geothermal.

Co-chair Richard Ha replies that the general idea seems good, but it is too early and nothing substantial has been done yet.

Meeting adjourned.

RECORDER'S MEMO

Document Text NOT Legible For Digital Imaging

R-885 STATE OF HAWAII
BUREAU OF CONVEYANCES
RECORDED
JUL 14, 2006 09:00 AM
Doc No(s) 2006-129683

/s/ CARL T. WATANABE
REGISTRAR OF CONVEYANCES

CTax (30): $10950.00

20 4/8 Z9

LAND COURT SYSTEM REGULAR SYSTEM

Return by Mail (X) Pickup ( ) To:

TGOH 200527898B-S
TGES A6-101-0915
BARBARA PAULO

Office of Hawaiian Affairs
711 Kapi`olani Blvd., Suite 500
Honolulu, HI 96813
Attn: Clyde W. Nāmu'o, Administrator

Total Number of Pages:

TMK Nos. (3) 1-2-010-002 and 003
[Grant of Access Easement burdens TMK No. (3) 1-2-010-001
and benefits TMK Nos. (3) 1-2-010-002 and 003]

WARRANTY DEED AND GRANT OF ACCESS EASEMENT

KNOW ALL MEN BY THESE PRESENTS:

THAT, effective as of the __ day of _____, 2006, **THE TRUST FOR PUBLIC LAND**, a California nonprofit public benefit corporation, whose address is 116 New Montgomery Street Third Floor San Francisco, California 94105, hereinafter referred to as "Grantor" and the **OFFICE OF HAWAIIAN AFFAIRS**, a body corporate and instrumentality of the State of Hawai'i, whose address is 711 Kapi`olaniBoulevard, Suite 500, Honolulu, Hawai'i 96813, hereinafter referred to as the "Grantee," for a valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Grantor does hereby grant, bargain, sell and convey unto Grantee, its successors, assigns and representatives, in fee simple, those certain parcels of land situate at Puna, Island and County of Hawaii, State of Hawai'i, designated as "Wao Kele o Puna," containing an area of ± 25,855.891 acres, more particularly described in Exhibit "A" attached hereto and made a part hereof.

TOGETHER WITH a non-exclusive easement for access purposes granted to The Trust for Public Land, a California nonprofit public benefit corporation by C.R. Churchill, D.A. Heenan, Richard W. Gushman, II and Ronald J. Zlatoper, the duly appointed, qualified and acting Trustees Under The Will And Of The Estate Of James Campbell, Deceased, acting in their fiduciary and not in their individual capacities, by that certain Grant of Easement for Access Rights made as of July 14, 2006 and recorded in the Bureau of Conveyances of the State of Hawai'i ("Bureau of Conveyances") on July 14, 2006 as Document Number 2006-129681, over, across and through the road shown on the map attached hereto as Exhibit C-1 and incorporated herein by reference, which crosses the property described in Exhibit C-2 attached hereto and incorporated herein by reference, for the benefit of both Tax Map Key Nos. (3) 1-2-010-002 and 003, subject to the terms and conditions set forth therein.

AND the reversions, remainders, rents, income and profits thereof, and all of the estate, right, title, and interest of the Grantor, both at law and in equity, therein and thereto.

TO HAVE AND TO HOLD the same, together with all improvements, rights, easements, privileges and appurtenances thereunto belonging or in anyways appertaining or held and enjoyed therewith in fee simple unto said Grantee, the Grantee's successors and assigns, forever, free and clear of all liens and encumbrances except as described on Exhibit "B" attached hereto.

The Grantor, for itself, its successors and assigns, does hereby covenant with the Grantee, its successors and assigns, that the Grantor is lawfully seised in fee simple and possessed of the above-described land and premises, that it has a good and lawful right to convey the same as aforesaid, that the same is free and clear of all liens and encumbrances, except as noted on Exhibit "B" and that it will and its successors and assigns, shall WARRANT AND DEFEND the same unto the Grantee, its successors and assigns, forever, against the claims and demands of all persons whomsoever.

AND the undersigned hereto agree that this instrument may be executed in counterparts, each of which shall be deemed an original, and said counterparts shall together constitute one and the same instrument, binding all of the parties hereto, notwithstanding that all of the parties are not signatories to the original or the same counterparts. For all purposes, including, without limitation, recordation, filing and delivery of this instrument, duplicate, unexecuted and unacknowledged pages of the counterparts may be discarded and the remaining pages assembled as one document.

SIGNATURE PAGE TO FOLLOW

IN WITNESS WHEREOF, the parties have executed this instrument as of 11th day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By Ben R. Kudroff

Its REGIONAL COUNSEL

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

IN WITNESS WHEREOF, the parties have executed this instrument as of 1st day of July, 2006, effective as of the day, month, and year first above written.

Grantor:

THE TRUST FOR PUBLIC LAND, a California nonprofit corporation

By _____

Its _____

Grantee:

OFFICE OF HAWAIIAN AFFAIRS, a body corporate and instrumentality of the State of Hawai'i

By: _____
S. Haunani Apoliona
Its Chairperson

By: _____
Clyde W. Nāmu'o
Its Administrator

APPROVED AS TO FORM:

_____
Ernest M. Kimoto
Senior Staff Attorney
Office of Hawaiian Affairs

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ACKNOWLEDGEMENT

State of California
County of San Francisco

On this 11th day of July, 2006, before me, **Hsiao-Wen Shih**, a notary public, personally appeared **Brian R. Kirchoff** personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he/she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~) and that by his/~~her/their~~ signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____

HSIAO-WEN SHIH
COMM. #1556562
Notary Public-California
SAN FRANCISCO COUNTY
My Comm. Exp. Mar 4, 2009

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ACKNOWLEDGEMENT

State of Hawai'i)
) ss.
City and County of Honolulu)

On this 12th day of July, 2006, before me, personally appeared S. HAUNANI APOLIONA, to me known, who being by me duly sworn, did say that she is the Chairperson of the Board of Trustees of the Office of Hawaiian Affairs, a body corporate and instrumentality of the State of Hawai'i, and that in the absence of a seal that the foregoing instrument was signed on behalf of said Office of Hawaiian Affairs by authority of its Board of Trustees, and the said S. HAUNANI APOLIONA acknowledged said instrument to be the free act and deed of said Office of Hawaiian Affairs.

Notary Public, State of Hawai'i
Print Name: J. E. Okamoto

My commission expires: 7/29/10

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ACKNOWLEDGEMENT

State of Hawai'i)
) ss.
City and County of Honolulu)

On this 12th day of July, 2006, before me, personally appeared CLYDE W. NĀMU'O, to me known, who being by me duly sworn, did say that he is the Administrator of the Office of Hawaiian Affairs, a body corporate and instrumentality of the State of Hawai'i and that in the absence of a seal that the foregoing instrument was signed on behalf of said Office of Hawaiian Affairs by authority of its Board of Trustees, and the said Administrator acknowledged said instrument to be free act and deed of said Office of Hawaiian Affairs.

Notary Public, State of Hawai'i
Print Name: J. E. Okamoto

My commission expires: 5/22/10

EXHIBIT "A"

PARCEL FIRST [TMK NO. (3) 1-2-010-002]:

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL A, same being portions of the Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F No. 20,315 dated December 13, 1985), and thus bounded and described as per survey dated December 13, 1985, to wit:

Beginning at the west corner of this parcel of land and on the south boundary of Land Court Application 1053, the coordinates of said point beginning referred to Government Survey Triangulation Station "OLAA" being 47,769.67 feet south and 8,228.41 feet west, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	24,288.19	feet along Land Court Application 1053;
2.	345°	23'	30"	1348.57	feet along the remainder of Government Lands;
3.	313°	00'		1221.60	feet along the remainder of Government Lands;
4.	330°	16'		4682.10	feet along the remainder of Government Lands;
5.	262°	03'		1960.70	feet along the remainder of Government Lands;
6.	290°	02'		627.40	feet along the remainder of Government Lands;
7.	314°	28'		4581.80	feet along the remainder of Government Lands;
8.	314°	47'		744.40	feet along the remainder of Government Lands;
9.	314°	12'		735.30	feet along the remainder of Government Lands;
10.	315°	31'		1825.53	feet along the remainder of Government Lands;
11.	40°	41'		13.81	feet along the north side of 20-Foot Road;
12.	338°	15'		14.99	feet along the west side of 20-Foot Road;
13.	60°	05'	12"	25,840.22	feet along Parcel B of Government Lands;
14.	140°	23'		16,220.18	feet along Parcel B of Government Lands to the point of beginning and containing an area of 9,012 acres, more or less.

PARCEL SECOND [TMK NO. (3) 1-2-010-003]:

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL B, same being portions of Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F. No. 20,316 dated December 13, 1985), and thus bounded and described as per survey dated December 13, 1985, to wit:

Beginning at the west corner of this parcel of land and at an angle on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 55,748.70 feet south and 22,096.90 feet west, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	16,000.00	feet along Land Court Application 1053;
2.	320°	23'		16,220.18	feet along Parcel A of Government Lands;
3.	240°	05'	12"	25,840.22	feet along Parcel A of Government Lands;
4.	338°	15'		3262.76	feet along the west side of the 20-Foot Road;
5.	340°	23'		19.26	feet along the west side of the 20-Foot Road;
6.	342°	31'		250.51	feet along the west side of the 20-Foot Road;
7.	337°	27'		156.17	feet along the west side of the 20-Foot Road;
8.	347°	14'		271.04	feet along the west side of the 20-Foot Road;
9.	348°	38'		331.85	feet along the west side of the 20-Foot Road;
10.	353°	51'		125.10	feet along the west side of the 20-Foot Road;
11.	359°	30'		1278.10	feet along the west side of the 20-Foot Road;
12.	358°	59'		2128.77	feet along the west side of the 20-Foot Road;
13.	332°	38'		221.69	feet along the west side of the 20-Foot Road;
14.	315°	33'		287.92	feet along the west side of the 20-Foot Road;
15.	258°	17'		9.45	feet along the south side of the 20-Foot Road;
16.	352°	29'		6915.35	feet along Parcel C of Government Lands;

17.	56°	27'		1460.60	feet along Lots 3-B and 3-A of Upper Kaimu Homesteads;
18.	39°	38'		3534.10	feet along Lot 3-A of Upper Kaimu Homesteads, Grant 6571 to K. Kamakani, Grant 6330 to S. Kamelamela and Grant 6328 to D. Kamelamela;
19.	53°	04'		10,520.90	feet along Government Lands;
20.	53°	31'	30"	9863.30	feet along Grant 9275 to H. M. Holt, et al., Trustees under the Will and of the Estate of James Campbell, Deceased;
21.	148°	00'		4100.00	feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
22.	116°	00'		8150.00	feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
23.	126°	59'		25,105.30	feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo to the point of beginning and containing an area of 16,843.891 acres, more or less.

BEING A PORTION OF THE LANDS ACQUIRED BY TRUSTEES' LIMITED WARRANTY DEED

GRANTOR: C.R. CHURCHILL, D.A. HEENAN, RICHARD W. GUSHMAN, II and RONALD J. ZLATOPER, the duly appointed, qualified and acting TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED

GRANTEE: THE TRUST FOR PUBLIC LAND, a California nonprofit public benefit corporation

DATED: July 11, 2006
RECORDED: Document No. 2006-129680

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EXHIBIT "B"

PERMITTED ENCUMBRANCES

1. Any lien for real property taxes not yet delinquent [Tax Map Key Nos. (3) 1-2-010-002 and 003].

2. AS TO PARCEL FIRST [TMK NO. (3) 1-2-010-002] ONLY:

   (A) Puna Forest Reserve as shown on the tax map.

   (B) The land has no recorded access to a public roadway.

3. AS TO PARCELS FIRST AND SECOND:

   (A) INSTRUMENT: LAND PATENT GRANT NUMBER S-15,666

   DATED: February 27, 1987

   The foregoing includes, but is not limited to, matters relating to reservation of minerals, water and prehistoric and historic remains.

   (B) FINAL JUDGMENT; EXHIBITS "A" AND "B"

   AGAINST: THE ESTATE OF JAMES CAMPBELL, DECEASED; W.H. MCVAY AND P.R. CASSIDAY, in their fiduciary capacity as Trustees under the Will and of the Estate of James Campbell

   IN FAVOR OF: PELE DEFENSE FUND

   DATED: August 26, 2002
   FILED: Circuit Court of the Third Circuit, State of Hawaii, 89-089, on August 26, 2002
   RECORDED: Document No. 2002-163259 on September 16, 2002

   (C) Claims arising out of customary and traditional rights and practices, including without limitation those exercised for subsistence, cultural, religious, access or gathering purposes, as provided for in the Hawaii Constitution or the Hawaii Revised Statutes.

(D) Discrepancies, conflicts in boundary lines, shortage in area, encroachments or any other matters which a correct survey or archaeological study would disclose.

(E) UNRECORDED LICENSE

LESSOR: C. R. CHURCHILL, D. A. HEENAN, RICHARD W. GUSHMAN, II, and RONALD J. ZLATOPER, Trustees under the Will and of the Estate of James Campbell, deceased

LESSEE: STATE OF HAWAII, Department of Land and Natural Resources

DATED: September 9, 1996, effective February 1, 1996

As amended by that certain unrecorded First Amendment of License dated as of December 13, 2005, of which a Memorandum of License dated as of December 13, 2005, recorded as Document No. 2005-256550.

PARTIAL ASSIGNMENT OF LICENSOR'S INTEREST IN LICENSE (OLSON) dated as of December 19, 2005 ("Effective Date"), recorded as Document No. 2006-010986, by and among C.R. CHURCHILL, D.A. HEENAN, RICHARD W. GUSHMAN, II and RONALD J. ZLATOPER, TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED (the "Licensor" or "Assignor"), THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES (the "Licensee"), and EDMUND C. OLSON, as Trustee of the EDMUND C OLSON TRUST NO. 2. under agreement dated August 21, 1985 ("Assignee") [AFFECT OTHER LANDS].

PARTIAL ASSIGNMENT OF LICENSOR'S INTEREST IN LICENSE (TPL) dated as of July 14, 2006, recorded as Document No. 2006-129682, by and among C.R. CHURCHILL, D.A. HEENAN, RICHARD W. GUSHMAN, II and RONALD J. ZLATOPER, TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED (the "Licensor" or "Assignor"), THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES (the "Licensee"), and THE TRUST FOR PUBLIC LAND, a California nonprofit public benefit corporation ("Assignee").

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(F) The restrictions, covenants, reservations, limitations, conditions and agreements contained in the following:

INSTRUMENT: TRUSTEES' LIMITED WARRANTY DEED

DATED: July 11, 2006
RECORDED: Document No. 2006-129680

EXHIBIT C-1

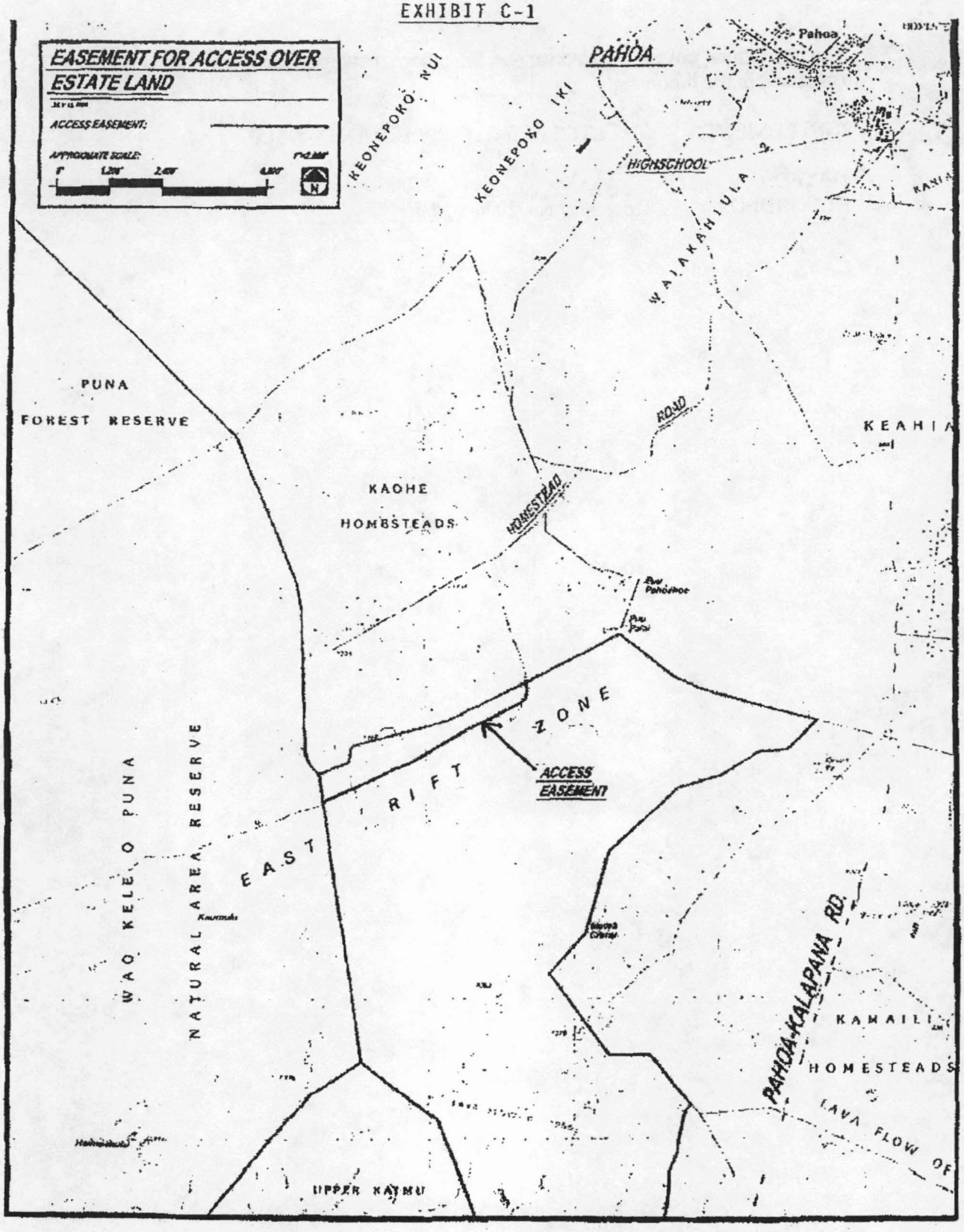
EASEMENT FOR ACCESS OVER ESTATE LAND
ACCESS EASEMENT:
APPROXIMATE SCALE:
PAHOA
Pahoa
KEONEPOKO NUI
KEONEPOKO IKI
HIGHSCHOOL
WAIAKAHIULA
PUNA
FOREST RESERVE
KAOHE
HOMESTEADS
HOMESTEAD
ROAD
KEAHIA
Puu Pahoihoi
Puu Poni
RIFT ZONE
ACCESS EASEMENT
EAST
NATURAL AREA RESERVE
WAO KELE O PUNA
Kaumaka
Waiaka Crater
PAHOA-KALAPANA RD.
KAMAILI
HOMESTEADS
LAVA FLOW OF
Hahaialua
UPPER KAIMU

EXHIBIT C-2

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL C, same being portions of the Government Land of Kamaili, Kahena and Kikala (C.S.F No. 20,317 dated December 13, 1985), and thus bounded and described as per survey dated December 13, 1985, to wit:

Beginning at the east corner of this parcel of land, on the south boundary of Royal Patent 4475, Land Patent 8199, Land Commission Award 7713, Apana 13 to V. Kamamalu and at the north corner of Grant 7365 to J. K. Pau, the coordinates of said point of beginning referred to Government Survey Triangulation Station "KALIU" being 115.60 feet south and 9,325.70 feet west, thence running by azimuths measured clockwise from true South:

1.	46°	00'	982.00	feet along Grant 7365 to J. K. Pau;
2.	85°	00'	652.00	feet along Grant 7365 to J. K. Pau;
3.	58°	45'	1050.00	feet along Grant 7365 to J. K. Pau;
4.	73°	30'	1005.00	feet along Grant 7547 to Wm. K. Keliihoomalu;
5.	45°	46'	1197.50	feet along Grant 7547 to Wm. K. Keliihoomalu;
6.	139°	03'	50.08	feet along the north side of 50-Foot Road;
7.	45°	46'	1064.16	feet along the west side of 50-Foot Road;
8.	16°	10'	2051.31	feet along the west side of 50-Foot Road;
9.	38°	34'	1319.67	feet along the west side of 50-Foot Road;

10.	323°	16'		2381.65	feet along the south side of 50-Foot Road;
11.	270°	00'		981.59	feet along the south side of 50-Foot Road;
12.	316°	30'		1493.59	feet along the south side of 50-Foot Road to the northwest side of Upper Puna Road;
13.	Thence along the northwest side of Upper Puna Road, the direct azimuth and distance being:				
	27°	43'	20"	4458.54	feet;
14.	55°	41'	15"	171.71	feet along the northwest side of Upper Puna Road;
15.	Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 150.00 feet, the chord azimuth and distance being:				
	79°	01'	15"	118.82	feet;
16.	102°	21'	15"	518.59	feet along the northwest side of Upper Puna Road;
17.	Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 250.00 feet, the chord azimuth and distance being:				
	77°	01'	15"	213.94	feet;
18.	51°	41'	15"	284.74	feet along the northwest side of Upper Puna Road;
19.	Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 475.00 feet, the chord azimuth and distance being:				

	55°	01'	15"	55.24	feet;
20.	58°	21'	15"	354.39	feet along the northwest side of Upper Puna Road;
21.	Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 450.00 feet, the chord azimuth and distance being:				
	50°	46'	15"	118.77	feet;
22.	135°	50'		1250.91	feet along Grant 7731 to L. K. Swain;
23.	157°	30'		3467.50	feet along Grant 7593 to Louisa Swain, Grant 7478 to L. E. Blaisdell and the northwest end of 50-Foot Road;
24.	127°	35'		2173.00	feet along Lot III-B of Upper Kaimu Homesteads;
25.	172°	29'		6915.35	feet along Parcel B of Government Lands;
26.	258°	17'		139.94	feet along the south side of 20-Foot Road;
27.	244°	12'		614.60	feet along the south side of 20-Foot Road;
28.	195°	08'		397.80	feet along the south side of 20-Foot Road;
29.	254°	12'		783.69	feet along the south side of 20-Foot Road;
30.	254°	05'		1202.89	feet along the south side of 20-Foot Road;
31.	254°	48'		283.02	feet along the south side of 20-Foot Road;

1. Real Property Taxes have been fully paid up to and including June 30, 2006. (see tax statement attached)

Tax Key: (3) 1-2-010-001 Area Assessed: 1,930.000 acres

-Note:- Attention is invited to the fact that the premises covered herein may be subject to possible rollback or retroactive property taxes.

2. Any trails or rights-of-way, claims to which may be predicated upon prescriptive use or ancient Hawaiian use or custom.

3. The terms and provisions contained in the following:

INSTRUMENT : LAND PATENT GRANT NUMBER S-15,666

DATED : February 27, 1987

The foregoing includes, but is not limited to, matters relating to reservation of minerals, water and prehistoric and historic remains.

4. FINAL JUDGMENT; EXHIBITS "A" AND "B"

AGAINST : THE ESTATE OF JAMES CAMPBELL, DECEASED; W.H. MCVAY AND P.R. CASSIDAY, in their fiduciary capacity as Trustees under the Will and the Estate of James Campbell

IN FAVOR OF: PELE DEFENSE FUND

DATED : August 26, 2002
FILED : Circuit Court of the Third Circuit, State of Hawaii, Civil No. 89-089 (Hilo), on August 26, 2002
RECORDED : Document No. 2002-163259 on September 16, 2002

5. UNRECORDED LICENSE

LICENSOR : TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED

LICENSEE : STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES

DATED : September 9, 1996

As amended by the certain unrecorded First Amendment of License dated as of December 13, 2005, of which a Memorandum of License dated as of December 13, 2005, recorded as Document No. 2005-256550.

PARTIAL ASSIGNMENT OF LICENSOR'S INTEREST IN LICENSE (OLSON) dated as of December 19, 2005 ("Effective Date"), recorded as Document No. 2006-010986, by and among the TRUSTEES UNDER THE WILL AND OF THE ESTATE OF JAMES CAMPBELL, DECEASED, acting in their fiduciary and not in their individual capacities ("Licensor" or "Assignor"), THE STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES ("Licensee"), and EDMUND C. OLSON, as Trustee of the EDMUND C. OLSON TRUST NO. 2 under agreement dated August 21, 1985 ("Assignee").

6. The terms and provisions contained in the following:

INSTRUMENT : TRUSTEES' LIMITED WARRANTY DEED WITH COVENANTS

DATED : ----- (acknowledged December 20, 2005)
RECORDED : Document No. 2006-010985

The foregoing includes, but is not limited to, matters relating to Grantor's reserved right of a perpetual nonexclusive access (vehicular and pedestrian) easement.

7. Claims arising out of customary and traditional rights and practices, including without limitation those exercised for subsistence, cultural, religious, access or gathering purposes, as provided for in the Hawaii Constitution or the Hawaii Revised Statutes.

32.	242°	35'	876.64	feet along the south side of 20-Foot Road;
33.	245°	28'	581.05	feet along the south side of 20-Foot Road;
34.	242°	17'	539.85	feet along the south side of 20-Foot Road;
35.	246°	20'	20.81	feet along the south side of 20-Foot Road;
36.	240°	31'	1658.87	feet along the south side of 20-Foot Road;
37.	240°	47'	707.62	feet along the south side of 20-Foot Road;
38.	309°	05'	1550.70	feet along R. P. 4475, R. P. 6883, L. P. 8200, L. C. Aw. 7713, Ap. 14 to V. Kamamalu;
39.	296°	22'	753.00	feet along R. P. 4475, R. P. 6883, L. P. 8200, L. C. Aw. 7713, Ap. 14 to V. Kamamalu;
40.	286°	00'	2750.00	feet along R. P. 4475, L. P. 8199, L. C. Aw. 7713, Ap. 13 to V. Kamamalu to the point of beginning and containing an area of 1,930 acres, more or less.

ORIGINAL

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF LAND AND NATURAL RESOURCES, STATE OF HAWAI'I AND THE OFFICE OF HAWAIIAN AFFAIRS

I. INTRODUCTION

This Memorandum of Agreement ("Agreement") is entered into by and between the Department of Land and Natural Resources of the State of Hawai'i (the "Department"), by and through the Board of Land and Natural Resources (the "Board"), and the Office of Hawaiian Affairs ("OHA"). The term "DLNR" shall mean the Department, the Board, or both as the context requires. DLNR and OHA are collectively referred to as the Parties.

This Agreement is designed to promote increased understanding, cooperation, interaction, and to provide basic principles and guidelines for further negotiations on issues of mutual concern.

OHA has entered into an Agreement of Sale with The Trust for Public Lands ("TPL"), a California nonprofit public benefit corporation to purchase that certain real property known as Wao Kele O Puna, (Tax Map Keys: 1-2-10-2 and 1-2-10-3, respectively), consisting of approximately 25,855.891 acres, situated in Puna, Island and County of Hawai'i, State of Hawai'i (the Property), more particularly described in Exhibit "A" attached hereto.

The Parties wish to work together to provide proper management of the Property and to develop OHA's own capacity to manage lands independently from DLNR. The Parties further wish to preserve the Property's natural and cultural resources and maintain traditional and customary practices on the Property through appropriate resource management.

As discussed herein, DLNR will bear initial management responsibility as soon as the Property is designated as a forest reserve. However, management responsibility will be turned over to OHA as OHA acquires capacity, experience and expertise in land management.

II. TERMS

Subject to the conditions identified in part III below, the Parties agree as follows:

1. Purchase of the Property. OHA will purchase the Property with funding from the USDA Forest Service Forest Legacy Program and OHA. The exact funding levels are not known at this time but are expected to be approximately $3.4 million from the Forest Legacy Program with the balance to be paid by OHA. No DLNR funds will be used for the purchase.

2. Title. Title to the Property will be held in fee by OHA pursuant to authority created by Article XII of the State Constitution and Haw. Rev. Stat. § 10-4 (Cum. Supp. 2004) and Haw. Rev. Stat. § 10-5 (Cum. Supp. 2004).

3. Forest Reserve Designation. The Parties will cooperate in designating the Property as a forest reserve pursuant to Haw. Rev. Stat. chapter 183. The designation process shall commence as soon as possible and shall proceed as expeditiously as is possible under applicable law. Notwithstanding any other provision herein, DLNR or OHA may develop and improve the Property though plantings and erosion control and may construct such improvements as may be agreed herein or otherwise.

4. Compliance with Federal Grant Requirements. Management, use, and future disposition of the Property shall comply with all applicable U.S.D.A. Forest Legacy Federal Grant requirements and with applicable United States Department of Agriculture ("USDA") Forest Service Forest Legacy Program Guidelines (the "Guidelines"), until such time as the grant requirements and/or the Guidelines no longer apply or OHA is released of its federal grant obligations by the Forest Service/ Forest Legacy Program, other federal governing agency, or through an Act of the U.S. Congress. A copy of the Guidelines is attached as Exhibit "B".

5. Compliance with State Forest Reserve Requirements. Management, use, and future disposition of the Property shall comply with all applicable State of Hawai'i laws, rules, and regulations governing and relating to forest reserves as described in Haw. Rev. Stat. chapter 183 until such time as the Property is no longer held or designated as forest reserve property. In the event of conflict between requirements of federal and state law, federal law shall govern pursuant to Haw. Rev. Stat. § 29-15 (1993).

Use of the Property will also comply with the Findings of Fact and Conclusions of Law and Final Declaratory Judgment/Injunction issued on August 26, 2002 in *Pele Defense Fund vs. The Estate of James Campbell, Deceased et. al*, Civil No. 89-089, (the "PDF Final Judgment"), a true and correct copy of which is attached as Exhibit "C," except that no other statement herein, in the Plan, or in the PDF Final Judgment shall override or supercede the requirements of federal or state law, (including case law and regulations) relating to undeveloped real property.

6. Management Responsibility. As more fully described below, the Parties intend to develop a Comprehensive Management Plan (the "Plan") based upon the terms of this Agreement. All management and maintenance responsibilities and practices will conform with mutually agreed upon requirements set forth in therein.

All provisions of the Plan will be subject to the availability of funding.

Once the Property is designated as forest reserve (but not before), DLNR shall bear the primary responsibility for the management and maintenance of the Property for up to ten years after the signing of this Agreement or until such time as the Parties determine and agree that OHA is capable of assuming management responsibilities required by the Plan, whichever time is shorter.

7. Timeline. The Parties will make a good faith effort to complete the following in three (3) years: (a) develop the Plan, (b) plug and abandon the geothermal well located on the Property, (c) seek funding from other sources to assist with the management costs of the Property, and (d) remove the Geothermal Resource Subzone designation as discussed below in paragraph 16. Status reports concerning management issues, transfer of expertise, and property maintenance will be presented to and considered by the OHA board and the Board at least annually. Appropriate changes to the assignment of duties (primarily from DLNR to OHA), funding levels, management, and enforcement of regulations related to the Property may be made upon mutual agreement between the Parties.

8. Assumption of Management Responsibilities/Transfer of Knowledge. Transfer of management responsibility shall follow the Plan guidelines. The Plan shall define how over time the Parties will share responsibility for management of the Property, provided that full management responsibilities of the Plan shall be relinquished by DLNR and transferred to OHA within ten years of the signing of this Agreement.

OHA and DLNR shall each designate a person to act as liaison for transition of enforcement responsibilities and begin work on transition of responsibilities. The duties of each such person will include, but not be limited to, responsibility for general coordination of all Property activities, development of the Plan, seeking funding from the State Legislature and/or from external sources, seeking the support of the County of Hawai'i, implementing management activities, facilitating the transfer of knowledge from DLNR to OHA pertaining to land ownership and management, undertaking the necessary duties to change the Property designation to a forest reserve, and supervising public hearings and meetings. Additionally, OHA and DLNR shall each designate a person to act as liaison for transition of enforcement

responsibilities, development and implementation of transition plan and coordinating enforcement of applicable regulations.

9. Revocation. Upon agreement by the parties, DLNR shall cooperate with OHA to seek a revocation or suspension of designation as a forest reserve in the manner provided by law.

10. Interim Plan. Prior to closing of OHA's purchase of the Property, the Parties shall develop an interim management plan for submission to the Forest Legacy Program. The interim plan shall provide guidelines for the management and protection of the property by the Parties, as funds and capacity permit, until such time as the property is designated a forest reserve and until such time as the Comprehensive Management Plan can be implemented.

11. Comprehensive Management Plan. Upon execution of this Agreement, the Parties agree to develop the Plan for the Property. The Parties shall form an advisory council for the development of the management plan consisting of the Pele Defense Fund and other interested community members mutually selected by DLNR and OHA. The cost of developing the Plan shall be funded as provided in paragraph 15 below.

The Plan shall be developed according to the following conditions and may contain such other terms and conditions agreed to by the Parties:

a. *Assessment.* The Plan shall include an inventory and assessment of natural and cultural resources, historic sites, risks, threats to resources, interpretive values, and economic development potential. The section on economic development potential shall identify those uses consistent with: status as a forest reserve, the protection of traditional and customary uses of the site, sustainable use and protection of the resources of the site, and the terms of the Forest Legacy Program funding.

b. *Existing Improvements.* Subject to the availability of funding and identification as a priority action under the Plan, management of the Property shall include maintenance and repair of existing roads and historical sites on the Property.

c. *Allowable Uses of Property.* Subject to requirements of state law applicable to forest reserves, to any other applicable state law, to any applicable requirements of the Forest Legacy Program, and to future revision by the Parties, allowable uses of the Property shall include but are not limited to the following:

(1) Public Access. Public Access shall be allowed to the extent required by federal and state law and the Guidelines. Public access beyond that required by law and the Guidelines will be determined by the Parties based on a comprehensive inventory of the Property, which will identify and assess the access points, the natural and cultural resources, the historic sites, the risks, the threats to resources, and the interpretive values.

(2) Cultural, natural resources, open space and recreational use. The general use of the Property shall be for cultural, natural resource, and open space purposes. Passive recreational or educational purposes that require neither surface alteration subject to the local grading ordinance nor other development of the land may be permitted unless specifically excluded by the Plan. The Plan may, but need not, allow development of recreational use infrastructure and facilities such as trails, access roads, parking, fencing, cultural and environmental education facilities (e.g. kiosks).

(3) Preservation of Plant and Wildlife Habitat. The Parties will protect and enhance native plant and wildlife habitat, the natural, scenic and open-space nature of the Property.

(4) Traditional Hunting and Gathering Practices. Wildlife hunting not

prohibited by applicable laws or regulations may be permitted, if it is conducted in a manner that does not significantly deplete native wildlife resources or damage the ecology of the Property. Traditional hunting and gathering practices shall be governed in accordance with federal and state law, the Guidelines, and the PDF Final Judgment.

(5) Water. Subject to written approval from OHA and DLNR, exploration or extraction of water resources and any activity associated therewith, with the exception of water needed for management practices agreed upon in the management plan may be permitted as long as there is no damage to natural resources, existing forests, or soils.

d. *Prohibited Uses.* The following "non-forest uses" as defined by the Forest Legacy Program are uses of the land inconsistent with maintaining forest cover and shall be prohibited on the Property.

(1) Mineral Extraction. Any exploration or extraction of oil, gas, minerals, steam, hydrocarbons, soil, sands, gravel or other material on or beneath the Property for the purpose of exporting these materials/resources off the Property shall be prohibited.

(2) Grading and Excavation. Alteration of landforms by grading or excavation of topsoil, earth, or rock, inconsistent with Forest Legacy Program guidelines shall be prohibited. Alteration of landforms necessary or appropriate for appropriate public access, cultural restoration or wildlife or forest management, or emergency purposes (such as fire fighting) and in keeping with good natural resource management practices shall not be prohibited.

(3) Subdividing Land. The division, subdivision, partition, or de facto subdivision of the Property inconsistent with the Forest Legacy Program guidelines shall be prohibited. However, this paragraph does not prohibit the lease, license, or other temporary

disposition of a portion of the Property or a voluntary conveyance to a governmental or nonprofit entity for conservation or public access purposes.

(4) Commercial and Industrial Uses. The establishment of any commercial or industrial uses inconsistent with the Forest Legacy Program Guidelines shall be prohibited.

(5) Signage. The construction, placement, or erection of any sign or billboards, excepting signs necessary for management purposes or to control unauthorized or dangerous activities, or signs, appropriately placed, that acknowledge the financial support of donors in the purchase of the Property shall be prohibited.

A preliminary investigation of potential access and trail routes will be conducted to consider exposure to specific dangerous natural conditions. It is the intent of the Parties to examine using the warning sign design and placement process pursuant to Act 82 SLH 2003, and the ancillary Title 13, Chapter 8 Hawai'i Administrative Rules as appropriate.

(6) Storage of Waste. The storage, dumping or accumulation of trash, garbage, or waste on the Property shall be prohibited.

(7) Exotic Plants or Animals. The introduction of invasive exotic animals or plants that would alter or impair the conservation values of the Property shall be prohibited.

12. License Agreement. On September 9, 1996, the Campbell Estate entered into a well monitoring license agreement with the DLNR, which license covers and affects the property. Unless otherwise agreed, all rights and obligations that exist pursuant to the License Agreement (as amended) shall remain unaffected by this Agreement.

13. Plugging and Abandonment. The Parties shall work together to secure funding for plugging and abandonment of the existing geothermal well shaft on the Property. The

Parties shall make reasonable and diligent efforts to plug and abandon the existing geothermal well site on the Property within three years after acquisition of the Property by OHA. To facilitate the plugging of the well in an expedient manner, the Parties agree to the following:

a. *Legislative Funding.* The Parties shall work cooperatively to secure funding from the State Legislature during the 2006 legislative session for the DLNR to plug, and abandon the well. DLNR agrees to seek funding in subsequent legislative sessions as necessary

b. The Parties shall work cooperatively to seek appropriate federal funding for plugging and abandonment of the well. The Parties realize and acknowledge, however, that such funds are not presently available.

c. *Alternative Funding Agreement.* If parts a. and b. immediately above do not adequately cover the costs of plugging and abandonment, OHA agrees to seek OHA board approval to cost-share up to TWENTY PERCENT (20%) of the total project costs of plugging and abandonment of the well. The Parties shall encourage the County of Hawai'i to partner in the effort to plug and abandon the well and to cost-share up to THIRTY PERCENT (30%) of the total project costs.

14. Additional Resource-Management Funding. The Parties shall work cooperatively and in good faith to secure specific funding for natural and cultural resource management and enforcement on the property.

15. Management Funding. For each year during which DLNR continues to manage the Property (that is, until management responsibility is turned over to OHA as contemplated herein), OHA shall transfer to DLNR up to TWO HUNDRED TWENTY EIGHT THOUSAND AND NO/100 DOLLARS ($228,000.00) for the development of the Plan, management of the Property, and for protection and enforcement actions on the Property. By

April 1 of each year during which DLNR continues to manage the property, OHA will make a good faith effort to determine the amount of funding to be transferred to DLNR for its use during the next fiscal year. The amount of funds transferred will determine the level of management and protection that is implemented. The said amount is to be expended as agreed by the Parties. Subject to appropriation and allotment, DLNR will contribute up to ONE HUNDRED THOUSAND AND NO/100 DOLLARS ($100,000.00) annually either in appropriated funds (obtained from various sources) or through in-kind expenditures from existing resources, volunteer efforts, and/or budgets for the development of the Plan and management of the property, by providing the liaison person described above, or by providing on site management capacity, transfer of knowledge and active management practices. An estimated budget for illustration purposes only is shown in Exhibit "D."

At least quarterly, DLNR shall provide to OHA an expenditure report, which provides a description of expenditures made during the prior quarter as well as a summation of quarterly expenditures and cumulative expenditures to date. The report should provide a description of each expenditure, identify the amount expended and identify whether the expenditure was an in-kind expenditure or from appropriated OHA or DLNR funds. DLNR shall also report to OHA the assigned DAGS number for all assets including property, plant and equipment that are acquired with OHA funds. Upon complete transfer of the management duties to OHA as contemplated herein, DLNR shall transfer assets purchased with OHA funds to OHA.

16. Geothermal Subzone Designation Removal. The Parties shall work together to remove the Geothermal Resource Subzone designation specified under Haw. Rev. Stat. § 205-5.1 (2001) and Haw. Rev. Stat. § 205-5.2 (2001), from the Property.

17. If any of the terms identified above are deemed unachievable, unfeasible, impractical, or not viable for any reason, the Parties agree in good faith to cooperate and work together to find alternate feasible and acceptable terms that will facilitate the intended goals.

18. The Parties agree in good faith to cooperate with each other to accomplish the intended goals identified above. Cooperation includes, but is not limited to, providing copies or access to documents referenced in this Agreement, providing copies of or access to other relevant documents, and providing information that may facilitate the intended management transfer.

III. CONDITIONS

1. Governing Law. This Agreement shall be governed by the laws of the State of Hawai'i.

2. Amendments. This Agreement may be amended only by the written agreement of the parties hereto.

3. Costs. Except as otherwise provided or agreed, each party shall bear its own costs and expenses relating to this Agreement and the Property.

4. Binding Effect. Upon execution of this Agreement by both Parties, the Parties shall cooperate and negotiate in good faith conditions and terms to complete and execute the definitive documents and instruments necessary to accomplish the intended goals. Terms and conditions of any future agreement shall be consistent with this Agreement and upon such other terms as the Parties shall agree.

The foregoing accurately reflects the Agreement between the Parties. We indicate our acceptance of this document and the agreement herein by executing this Agreement.

OFFICE OF HAWAIIAN AFFAIRS

Date 6-27-06.

By _____
CLYDE W. NĀMU'O
Its Administrator

BOARD OF LAND AND NATURAL RESOURCES

Date 6-27-06

By _____
PETER T. YOUNG
Its Chairperson

APPROVED AS TO FORM:

_____
Ernest M. Kimoto, Senior Staff Attorney
Office of Hawaiian Affairs

Date: June 27, 2006

APPROVED AS TO FORM:

_____
Deputy Attorney General

Date: 6/27/06

EXHIBIT "A"
Legal Description of the Wao Kele o puna PROPERTY

-PARCEL ONE:-

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL A, same being portions of the Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F No. 20,315 dated December 13, 1985), and thus bounded and described as per survey of Raymond S. Nakamura, Land Surveyor, with the Survey Division, Department:

Beginning at the west corner of this parcel of land and on the south boundary of Land Court Application 1053, the coordinates of said point beginning referred to Government Survey Triangulation Station "OLAA" being 47,769.67 feet South and 8,228.41 feet West, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	24,288.19	feet along Land Court Application 1053;
2.	345°	23'	30"	1,348.57	feet along the remainder of Government Lands;
3.	313°	00'		1,221.60	feet along the remainder of Government Lands;
4.	330°	16'		4,682.10	feet along the remainder of Government Lands;
5.	262°	03'		1,960.70	feet along the remainder of Government Lands;
6.	290°	02'		627.40	feet along the remainder of Government Lands;
7.	314°	28'		4,581.80	feet along the remainder of Government Lands;
8.	314°	47'		744.40	feet along the remainder of Government Lands;
9.	314°	12'		735.30	feet along the remainder of Government Lands;
10.	315°	31'		1,825.53	feet along the remainder of Government Lands;
11.	40°	41'		13.81	feet along the north side of 20-Foot Road;
12.	338°	15'		14.99	feet along the west side of 20-Foot Road;
13.	60°	05'	12"	25,840.22	feet along Parcel B of Government Lands;
14.	140°	23'		16,220.18	feet along Parcel B of Government Lands to the point of beginning and containing an area of 9,012 acres, more or less.

-PARCEL TWO:-

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Land Patent Grant Number S-15,666 to The Trustees under the Will and of the Estate of James Campbell, deceased) situate, lying and being at Puna, Island and County of Hawaii, State of Hawaii, being PARCEL B, same being portions of Government Land of Makuu, Kaohe, Kaimu, Kehena, Kapaahu and Kamaili (C.S.F. No. 20,316 dated December 13, 1985), and thus bounded and described as per survey of Raymond S. Nakamura, Land Surveyor, with the Survey Division, Department:

Beginning at the west corner of this parcel of land and at an angle on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 55,748.70 feet South and 22,096.90 feet West, thence running by azimuths measured clockwise from true South:

1.	240°	05'	12"	16,000.00	feet along Land Court Application 1053;
2.	320°	23'		16,220.18	feet along Parcel A of Government ands;
3.	240°	05'	12"	25,840.22	feet along Parcel A of Government ands;
4.	338°	15'		3,262.76	feet along the west side of the 20-Foot Road;
5.	340°	23'		19.26	feet along the west side of the 20-Foot Road;
6.	342°	31'		250.51	feet along the west side of the 20-Foot Road;
7.	337°	27'		156.17	feet along the west side of the 20-Foot Road;
8.	347°	14'		271.04	feet along the west side of the 20-Foot Road;
9.	348°	38'		331.85	feet along the west side of the 20-Foot Road;
10.	353°	51'		125.10	feet along the west side of the 20-Foot Road;
11.	359°	30'		1,278.10	feet along the west side of the 20- Foot Road;
12.	358°	59'		2,128.77	feet along the west side of the 20- Foot Road;
13.	332°	38'		221.69	feet along the west side of the 20-Foot Road;
14.	315°	33'		287.92	feet along the west side of the 20-Foot Road;
15.	258°	17'		9.45	feet along the south side of the 20-Foot Road;
16.	352°	29'		6,915.35	feet along Parcel C of Government Lands;
17.	56°	27'		1,460.60	feet along Lots 3-B and 3-A of Upper Kaimu Homesteads;

18. 39° 38' 3,534.10 feet along Lot 3-A of Upper Kaimu Homesteads, Grant 6571 to K. Kamakani, Grant 6330 to S. Kamelamela and Grant 6328 to D. Kamelamela;

19. 53° 04' 10,520.90 feet along Government Lands;

20. 53° 31' 30" 9,863.30 feet along Grant 9275 to H. M. Holt, et al., Trustees under the Will and of the Estate of James Campbell, Deceased;

21. 148° 00' 4,100.00 feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;

22. 116° 00' 8,150.00 feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;

23. 126° 59' 25,105.30 feet along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo to the point of beginning and containing an area of 16,843.891 acres, more or less.

EXHIBIT "B"

FINAL

Forest Legacy Program Implementation Guidelines

June 30, 2003

EXHIBIT "B"

USDA Forest Service State & Private Forestry Cooperative Forestry
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INTRODUCTION

The Cooperative Forestry Assistance Act (CFAA) of 1978, as amended, (16 U.S.C. 2101 et. seq.) recognizes that the majority of the Nation's productive forest lands are in private ownership; that private landowners are facing increased pressure to convert their forest lands to other uses; that greater population density, user demands and restrictions on Federal and other public lands are placing increased pressures on private lands to provide a wide variety of products and services from working forests including timber and other forest commodities, fish and wildlife habitat, watershed function and water supply, aesthetic qualities, historical and cultural resources, and recreational opportunities; and that good stewardship of privately held forest lands requires a long-term commitment that can be fostered through a partnership of Federal, State, local government and individual efforts.

In 1990, the Forest Legacy Program (FLP) was established to promote the long-term integrity of forestlands. The Secretary was directed to establish the FLP in cooperation with State, regional, and other units of government. In carrying out this mandate, the Secretary of Agriculture is authorized to acquire lands and interests in lands in perpetuity for inclusion in the FLP. Landowner participation in the FLP, including the sale of lands and interests in lands, is entirely voluntary. The Program is implemented through State participation, consistent with these National FLP guidelines, and as described in each State Assessment of Need. The FLP goals and objectives are accomplished through Forest Service (FS) cooperation with State partners, Federal agencies, local units of government, forest landowners and other partners. The FLP identifies and protects environmentally important private forestlands that are threatened by conversion to nonforest uses and provides the opportunity for continuation of traditional forest uses, such forest management activities and outdoor recreation.

The guidelines are organized in three parts:

PART 1 - General Program Guidelines: Program direction applicable to all aspects of the FLP.

PART 2 - State Grant Program Guidelines: Program direction applicable to States and Forest Service (FS) Regions/Area/IITF where a State has elected the State grant option and where ownership of lands or interests in lands is vested in a State or subdivision of a State.

PART 3 - Federal Acquisition Program Guidelines: Program direction applicable to States and FS Regions/Area/IITF selecting the Federal acquisition and ownership process, where ownership of lands or interests in lands is vested in the United States (U.S.).

EXHIBIT "B"

PART 1 - GENERAL PROGRAM GUIDELINES

I. Authority and Purpose of the Forest Legacy Program (FLP)

A. Authority The Cooperative Forestry Assistance Act (CFAA) of 1978, as amended, (16 U.S.C. 2101 et. seq.) provides authority for the U.S. Secretary of Agriculture (Secretary) to provide financial, technical, educational, and related assistance to States, communities, and private forest landowners. Section 1217 of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (P.L. 101-624:104 stat.3359; 16 U.S.C. 2103c), also referred to as the 1990 Farm Bill, amended the CFAA and directs the Secretary to establish the FLP to protect environmentally important forest areas that are threatened by conversion to nonforest uses. This authority continues indefinitely. Through the 1996 Farm Bill (Federal Agricultural Improvement and Reform Act of 1996; P.L. 104-127; Title III - Conservation; Subtitle G - Forestry; Section 374, Optional State Grants for Forest Legacy Program), the Secretary is authorized, at the request of a participating State, to make a grant to the State to carry out the FLP in that State, including the acquisition by the State of lands and interests in lands.

B. Purpose of the Forest Legacy Program The purpose of the FLP is to ascertain and protect environmentally important forest areas that are threatened by conversion to nonforest uses.

FLP seeks to promote forestland protection and other conservation opportunities. Such purposes shall include the protection of important scenic, cultural, fish, wildlife and recreational resources, riparian areas and other ecological values. Traditional forest uses, including timber management, as well as hunting, fishing, hiking, and similar recreational uses are consistent with purposes of the FLP. Both purchased and donated lands and interests in lands through the use of conservation easements and fee-simple purchase are used to acquire forested land meeting Forest Legacy purposes from willing sellers or donors.

C. Delegations of Authority The Secretary has delegated authority to administer all aspects of the FLP to the Under Secretary for Natural Resources and Environment (7 CFR 2.20(a)(2)(xvi)) who in turn has delegated the authority to the Chief of the Forest Service (7 CFR 2.60(a)(16). Delegations only apply within the U.S. Department of Agriculture and its agencies. The role of State and Regional programs, and the right of States to elect the State Grant Option, are contained in the authorizing statute and these program implementation guidelines.

II. Description of Terms and Abbreviations

Assessment of Need (AON) is a document produced by a State, or a federally recognized Indian Tribe, in consultation with the State Forest Stewardship Coordinating Committee (SFSCC). The AON contains the an assessment of the forests and forest

uses, a description of forces that are converting forests to nonforest uses, describes Eligibility Criteria developed by the State to identify important forest areas to be proposed as Forest Legacy Areas (FLA), and acts as a guide to implementation of FLP in the State.
Assessment of Need (AON) Amendment is a document produced by a State to amend their AON, to add or delete Forest Legacy Areas (FLA), or to modify the Eligibility Criteria.

CFAA is the Cooperative Forestry Assistance Act of 1978, P.L. 95-313, 92 stat. 365, 16 U.S.C., 2101 et seq. (as amended through P.L. 107-195, June 16, 2002).

Conservation Easement is a legal agreement a property owner makes with a governmental entity or a nonprofit organization to restrict activities allowed on the land in order to protect specified conservation values. Easement restrictions are tailored to the particular property and to the interests of the individual landowner. All FLP conservation easements are held in perpetuity.

Eligibility Criteria are a set of factors developed by the State lead agency, in consultation with the State Forest Stewardship Coordinating Committee (SFSCC), to evaluate geographic areas to determine if they contain significant environmental values to be considered an 'important forest area' and contain "threats" of conversion to be eligible as a Forest Legacy Area (FLA).

Federal Appraisal Standards are those standards contained in the publication entitled "Uniform Appraisal Standards for Federal Land Acquisitions: Interagency Land Acquisition Conference, 2000," or subsequent amendments or updates. These standards are available for purchase from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 204029328 (ISBN 0-16-038050-2) or online at http://www.usdoj.gov/enrd/land-ack/

Forest Legacy Area (FLA) is a geographic area with important forest and environmental values, that satisfies identified Eligibility Criteria and has been delineated, described, and mapped in a State's AON for the FLP. Acquisition of lands and interests in lands for the FLP can only occur within approved FLAs.

Forest Legacy Area (FLA) Boundary Adjustment is a minor change to an existing FLA to create a more logical or manageable boundary.

Forest Legacy Program (FLP) Project is an individual or series of land or interest in land acquisition transaction(s). The transaction(s) can be on an individual tract or multiple tracts in a distinct geographical area. A FLP project relates to a single funding event in a given fiscal year. FLP projects can have a single parcel that can be completed at one closing or more than one parcel that can be completed in a succession of closings. If a successive FLP project is proposed on a parcel or in a distinct geographic area each transaction is treated as an independent unit in the project selection process and funding is not guaranteed.

EXHIBIT "B"

Forest Service (FS) is the United States Department of Agriculture Forest Service.

Forest Service Region/Area/IITF refers to the field units of the Forest Service responsible for FLP management and oversight within the Forest Service Regions, Northeastern Area (Area) or International Institute of Tropical Forestry (IITF).

Forest Stewardship Plans, or multi-resource management plans, are prepared with the purpose of achieving long-term stewardship of forestland. Such plans identify landowner objectives and describe actions to protect and manage soil, water, range, aesthetic quality, recreation, timber, and fish and wildlife resources, and other conservation values identified on the tract. Plans are to be prepared by a professional resource manager. A Forest Stewardship Plan that meets the requirements of the Forest Stewardship Program or a multi-resource management plan is required for FLP qualification. The State Forester or equivalent, or their designee must approve the plan. (See Appendix F for sample content of a Forest Stewardship Plan).

Full Fee Purchase is a land conveyance where a purchaser acquires all rights, title and interest in a property from a seller or owner. It is also known as fee simple or fee acquisition.

Geographic Regions are the collection of States that makeup the National Association of State Foresters (NASF) Regions. The three regions are: North (consisting of the States within the FS Northeastern Area), South (consisting of all the States within the FS Southern Region, and the Territories of the International Institute of Tropical Forestry), and the West (consisting of all the States within the FS Northern, Rocky Mountain, Intermountain, Southwestern, Pacific Southwest (including the Commonwealth of the Northern Mariana Islands, Guam and American Samoa), Pacific Northwest and Alaska Regions. (See Appendix B for a map of the Forest Service's Regions/Area/IITF)

Indirect costs relate to costs of the management and administration of the FLP. Indirect costs, unlike salary, which is a direct cost, are defined as costs not readily assignable to a specific legacy acquisition. (See OMB Circular A-87, "Cost Principles for State, Local, and Indian Tribal Governments," for a description of indirect and direct costs).

In-kind contributions are non-cash contributions, including third-party contributions. In-kind contributions must be expenses necessary to accomplish program activities, and allowable if the Federal Government were required to pay for them. (See Appendix C for applicable OMB Circulars)

Interests in Land are a right, claim, or legal share in real property that are less than the full title.

Land Trust is a nonprofit organization, as described in 501(c) of the Internal Revenue Code of 1986, that protects land by working with landowners who wish to donate or sell fee title or conservation easements to maintain conservation values associated with the land.

EXHIBIT "B"

Market Value is the amount in cash, or in terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desires but is not obligated to buy. (*Uniform Appraisal Standards for Federal Land Acquisitions: Interagency Land Acquisition Conference*, 2000, p.4.)

Multi-State Entity is a government-established organization involving two or more States or Indian tribes whose jurisdiction encompasses all or portions of the land area of an FLA(s).

National Association of State Foresters (NASF) is the organization representing State forestry organizations in all 50 States, the territories and the District of Columbia. Nonfederal Cost Share refers the nonfederal cost-share required to receive FLP funding. There are three main categories of activities that meet this requirement: 1) the value of land, or interests in land, dedicated to the FLP that is not paid for by the Federal government, 2) nonfederal costs associated with program implementation, and 3) other nonfederal costs associated with a grant or other agreement which meets FLP purposes. The nonfederal cost-share must be documented, and in the case of a grant, must meet the timing, terms and conditions of the grant.

Nonforest Uses-

Noncompatible -nonforest uses are uses of the land inconsistent with maintaining forest cover including, but not limited to, activities that result in extensive surface disturbance such as residential subdivisions, commercial development, and mining. These uses generally should be excluded from FLP conservation easements or land purchases. FLP funds should only be used on parcels with forestland as defined in the State's AON.

Compatible - nonforest uses are nonforest uses of the land that may be compatible with forest uses as part of an undeveloped landscape, including cultivated farmland, pasture, grassland, shrubland, open water, and wetlands. These nonforest uses should be less than 25 percent of the total area. Forest Legacy funds should only be used on parcels with forestland as defined in a State's AON. Other funding sources may be used to protect nonforested areas on those parcels with less than the minimum required forest cover.

Nontrust Allotment Lands are privately owned fee simple lands owned by tribal members and if they are forested, are eligible for the FLP when they are located within an approved FLA. Trust lands and reservations are already protected through the trust relationship between the U.S. Department of the Interior and the tribe and are ineligible for the FLP.

EXHIBIT "B"

Pass-through describes a land transaction whereby a third party, such as a land trust, acquires interests in lands with the intent to convey such interests to a unit of government. The transaction can include a full or partial donation, or sale at market value.

Payment in Lieu of Taxes (PILT) is made by tax-exempt entities, including the Federal government, to compensate local jurisdictions for tax revenues foregone as a result of ownership by a tax-exempt owner. Any FLP tract acquired in fee and held by the FS is eligible for PILT payments (entitlement land as defined at 31 U.S.C. 6901). Federal funds for PILT are not authorized for any land or interests in land held by nonfederal entities, or for conservation easements held by the United States.

Program Funds are FLP funds that are appropriated by Congress and allocated by the FS to three categories: Project funds, Administrations funds, and AON Preparation funds.

Project Evaluation Criteria are developed by the States, in consultation with the State Forest Stewardship Coordinating Committees (SFSCC), to evaluate the eligible tracts submitted by interested landowners for inclusion in the FLP.
Relocation refers to the provision in the Uniform Relocation Assistance and Real Estate Property Acquisition Policies Act of 1970 (PL 91-646 or 42 U.S.C. 4601) which requires Federal agencies and programs to pay for the relocation of a person displaced by a federally funded real estate transaction.

Reserved Areas are designated areas where nonforest uses (e.g. house, barn, remote recreation camps, etc.) are or will be allowed, but are inseparable from the land holding and do not have a detrimental effect on the conservation easement values. These areas shall be defined and described in the conservation easement and may be restricted in terms of their use, or provisions made through cost and time to cure and treatment. To the extent possible these areas of noncompliance should be excluded from the FLP project.

Reserved Interest Deed is where the grantee (government) acquires all rights, titles, and interests in a property, except those rights, titles, and interests that may run with the land that are expressly reserved by a grantor (landowner).

Secretary is the U.S. Secretary of Agriculture.

State refers to any of the 50 States, Puerto Rico, Guam, the United States Virgin Islands, the Commonwealth of the Mariana Islands, and American Samoa participating in the FLP.

State Forest Stewardship Coordinating Committees (SFSCC) are defined, and their duties are described, in Section 19(b) of the CFAA (16 U.S.C. 2113). They are chaired and administered by the State Foresters, or equivalent State officials, with membership composed of representatives from the following agencies, organizations, or individuals:

Forest Service; Natural Resources Conservation Service; Farm Services Agency; Cooperative State Research, Education, and Extension Service; local government; consulting foresters; environmental organizations; forest products industry; forest land owners; land trusts; conservation organizations; the State fish and wildlife agency; and others determined appropriate by the Secretary. The SFSCC makes recommendations to the State lead agency regarding the AON, AON amendments, and the determination of project priorities.

State Lead Agency is that unit of State government responsible for coordinating the establishment and implementation of the FLP in the State, as designated by the Governor or pursuant to State law. The State lead agency is usually a forestry agency, but may be another natural resource agency.

Tribal Assessments of Need- An AON is developed by a federally recognized Indian Tribe in cooperation with the State and the SFSCC. Only nontrust allotment lands are eligible for FLP. Lands or interests in lands purchased under a Tribal FLP can be through a grant to a cooperating State or through the Federal acquisition option.

Working Lands Conservation Committee is a committee of the NASF having coordination and consultation responsibilities within that organization regarding the FLP.

III. National Environmental Policy Act (NEPA)

NEPA applies to certain proposed actions of the Federal Government. NEPA does not apply to the independent actions of States or private property owners. It has no applicability to a private property owner's use or development of his/her property rights, nor the development of a State's FLP. It could apply to Federal agency actions undertaken on private property if the U.S. acquired a right to permit or deny certain land uses and then proposed to exercise that right, but in such an instance it would be the U.S. that would be required to satisfy NEPA requirements, not the private owner.

It should be known that:

1. 1. A Programmatic Environmental Assessment and a Finding of No Significant Impact was completed for the national FLP and signed by the Chief of the Forest Service.
2. 2. Under the Federal acquisition option, the FS NEPA regulations (Forest Service's Environmental Policy and Procedures Handbook 1909.15-92.1, effective 9/21/92), the acquisition of an individual Forest Legacy tract and/or easement may be categorically excluded from the preparation of an Environmental Impact Statement or an Environmental Assessment unless scoping indicates extraordinary circumstances exist.

IV. Coordination with State Forestry Agencies

Whereas most State lead agencies are State Forestry agencies, and the CFAA establishes

a broad cooperative relationship between the FS and State Foresters, the FS shall appoint a representative to coordinate with the Working Lands Conservation Committee of the NASF (or its successor) regarding the FLP. Periodically, the Director of Cooperative Forestry, and the appointed FS representative shall meet with the NASF Working Lands Conservation Committee to assess program operations, accomplishments, and policies. In States where the State Forestry agency is not the designated State lead agency for the FLP, a coordinating mechanism shall be instituted between the State lead agency, the State Forester, and the SFSCC.

V. Assessment of Need (AON) and Identification of Forest Legacy Areas (FLA)

A State or a federally recognized Indian tribe conducts an AON, in cooperation with the SFSCC, to document their need for inclusion in the FLP, through an evaluation of current forests, forest uses, and the trends and forces causing conversion to nonforest uses. Federally recognized Indian Tribes must cooperate with the SFSCC when conducting an AON for nontrust allotments lands. The AON is intended to define the Eligibility Criteria to be used in the identification of important forest areas to be proposed as an FLA; identify and delineate the boundaries of forest areas meeting the Eligibility Criteria for designation as an FLAs; determine through analysis what defines "threatened" and "environmentally important forests"; and outline the State's project evaluation and prioritization procedures. The AON must be developed in consultation with SFSCC and approved by the State lead agency.
State lead agencies may utilize the services of land trusts or other entities in preparing the assessment. Information from existing sources may be used to prepare the AON, instead of initiating new studies that would duplicate existing data. Examples of appropriate sources include State Forest Resources Plans, State Comprehensive Outdoor Recreation Plans, growth management studies, State cultural site inventories, inventories of threatened and endangered species, and other State, regional or local plans, studies or reports. The AON shall include relevant information about both public and private lands, address the issue of how best to maintain the integrity of forestlands for future generations, and address pertinent issues as identified by the State.

At a minimum, the AON must address the following as they relate to the purpose of the FLP:

□.1. Forest resources including:

- Aesthetic and scenic values;
- Fish and wildlife habitat;
- Minerals resource potential;
- Public recreation opportunities;
- Soil productivity;
- Forest products and timber management opportunities;
- Watershed values including water quality protection;

2. 2. The present and future threat of conversion of forest areas to nonforest uses. States are responsible for defining the conversion threat(s);

3. 3. Historic uses of forest areas, and trends and projected future uses of forest resources;
4. 4. Current ownership patterns and size of tracts, and trends and projected future ownership patterns;
5. 5. Cultural resources that can be effectively protected;
6. 6. Outstanding geological features;
7. 7. Threatened and endangered species;
8. 8. Other ecological values;
9. 9. Public recreational opportunities;
10. 10. Protected land in the State, to the extent practical, including Federal, State, and municipal lands and land trust organizations lands;
11. 11. Issues identified by the SFSCC and in the public involvement process.

Using the above information the AON shall include the following:
1. 1. Identification of applicable Eligibility Criteria;
2. 2. Identification of specific FLA(s) for designation;
3. 3. Specific goals and objectives to be accomplished by the FLP;
4. 4. Process to be used by the State lead agency to evaluate and prioritize projects to be considered for inclusion in the FLP.

The project evaluation and prioritization process outlined in the AON should reflect the direction set forth in the CFAA to give priority to lands which can be effectively protected and managed, and which have important scenic or recreational values, riparian areas, fish and wildlife values including threatened and endangered species, or other ecological values. Traditional forest uses such as forest management activities, including timber management, and outdoor recreation opportunities are considered consistent with purposes of the FLP and are encouraged on FLP tracts when consistent with the State's AON and the conservation purposes for FLP tract acquisition. The prioritization process should implement a strategy that enhances existing protected forestlands or local and State conservation strategies as outlined in the AON.

The composition of the SFSCC is defined in Section 19(b) of the CFAA (16 U.S.C. 2113). States are encouraged to broaden this composition to include interests appropriate to benefit the FLP. This committee cooperates with the State lead agency in the preparation of the AON, identification of FLA Eligibility Criteria, the identification of proposed FLAs from which lands may be entered into the FLP, and recommendation of priority lands to be considered for enrollment in the Program.

Public participation and involvement in the AON preparation is a State responsibility. In the absence of established State procedures, NEPA may serve as an appropriate model for public involvement. The State lead agency will solicit involvement and comments on the AON from the public including State and local governments. The goals of public involvement include hearing concerns and views from interested and affected individuals and organizations, receiving new information, identifying and clarifying issues.

Based on the State-wide AON, the State lead agency, in consultation with the SFSCC, identifies specific geographic FLAs that meet the Eligibility Criteria, and recommends them to the FS for designation as of a FLA.

States are encouraged to cooperate in the identification of FLAs that cross State boundaries and to work together to coordinate acquisitions of lands or interests in lands that have complementary purposes. However, program implementation is undertaken by the individual States (State Grant Option) or by the FS (Federal Option).

The identification of proposed FLAs must include:

1. 1. Location of each geographic area on a map and a written description of the proposed FLA boundary;
2. 2. Summary of the analysis used to identify the FLA and its consistency with the Eligibility Criteria;
3. 3. Identification of important environmental values, and how they will be protected and conserved;
4. 4. The conservation goals or objectives in each FLA
5. 5. List of public benefits that will be derived from establishing each FLA;
6. 6. Identification of the governmental entity or entities that may hold lands or interests in lands (State grant option) or may be assigned management responsibilities for the lands and interests in lands enrolled in the program (Federal option); and
7. 7. Documentation of the public involvement process and analysis of the issues raised.

VI. Eligibility Criteria for Establishing Forest Legacy Areas (FLAs)

The CFAA directs the Secretary to establish Eligibility Criteria for the designation of FLAs, in consultation with the SFSCC. These criteria should be based upon the FLP purpose to protect environmentally important forest areas that are threatened by conversion to nonforest and be further developed through the AON.

FLA boundaries must encompass forestlands with significant environmental and other resource-based values. Areas may also include nonforested areas such as farms and villages if they are an integral part of the landscape and are within logical boundaries. Since FLA boundaries may not correspond to property boundaries, tracts located partially within the geographically defined FLA are eligible for the FLP, upon approval of a boundary adjustment by the FS Region/Area/IITF.

Indian reservations and tribal lands may have important features on the forested landscape. Indian tribes and States are encouraged to collaborate and to consider only nontrust allotment lands for designation as, or inclusion within, a FLA. Other tribal lands are already protected through the trust relationship between the U.S. Department of the Interior and the tribe and are ineligible for the FLP.

States are responsible for determining what defines "threatened" and "environmentally important forest areas" in the State. However, environmentally

important forest areas shall contain one or more of the following important public values, as defined by the States:

1. 1. Timber and other forest commodities
2. 2. Scenic resources;
3. 3. Public recreation opportunities;
4. 4. Riparian areas;
5. 5. Fish and wildlife habitat;
6. 6. Known threatened and endangered species;
7. 7. Known cultural resources;
8. 8. Other ecological values.

The FS, State or unit of State or local government may only acquire lands and interests in lands identified within a FLA under FLP authority on a willing seller/willing buyer basis.

VII. AON and Amendment Approval

The State lead agency must submit the AON, including proposed FLAs and Eligibility Criteria, to the FS Region/Area/IITF. The FS Region/Area/IITF with input from the FS Washington Office reviews the AON and works with the State lead agency to complete the AON. Once finalized, the FS Washington Office forwards the AON to the Secretary for final approval. Final approval establishes the FLP for the State.

AONs shall be periodically reviewed (at least at 5-year intervals) by the State lead agency, the FS Region/Area/IITF, and the SFSCC to assess whether AON amendments or updates are necessary. The results of reviews will be documented by the State lead agency. AONs should be amended as needed.

The State lead agency may amend the AON to make significant changes or minor adjustments. Significant changes include modifications to their FLP, changes to the FLA Eligibility Criteria, or to add or delete a FLA. These changes need to be made in consultation with the SFSCC and with public involvement. FLAs and project evaluation criteria shall be of a scale and detail to effectively focus delivery of the FLP.

Significant Amendments to an AON may address the following:

1. 1. Issues associated with maintaining the integrity of forestland and the proposed FLA specifically.
2. 2. Revision, if any, of the FLA Eligibility Criteria.
3. 3. Changes in policies or conditions that have occurred since the previous AON;
4. 4. The identification of proposed FLA(s) and conservation goals or objectives associated with that FLA (see Section V for detail on FLA identification).

The Chief of the Forest Service, or designee, provides final approval of the Amendment of an AON authored by a State lead agency after consultation with SFSCC.

In addition, the State lead agency may complete minor AON amendments, such as FLA boundary adjustment or project prioritization process. These minor changes need to be coordinated with the SFSCC, and need review and approval by the appropriate FS Region/Area/IITF.

VIII. Multi-State Identification of Forest Legacy Areas

States are encouraged to cooperate in the identification of FLA that cross State or Tribal boundaries and to work together to coordinate acquisitions of lands or interests in lands that have complementary purposes.

States may elect to jointly use an existing or new multi-State or regional entity to identify FLAs or develop FLP projects that cross State boundaries. The entity must be a government-established organization, whose jurisdiction encompasses all or portions of the land area of the FLA States involved. However, program implementation is undertaken by the individual States (State Grant Option) or by the FS (Federal Option).

The entity conducting a multi-State identification of FLAs is responsible for:

- Obtaining approval from the appropriate States or Indian tribes for FLAs within their boundaries,
- Cooperating with appropriate SFSCCs,
- Obtaining public comments on the identification of FLAs, and
- Complying with all other requirements of these guidelines.

IX. Project Selection Process

The FS will conduct a project selection process to arrive at a prioritized national project list for consideration in the President's budget for the upcoming fiscal year. The project selection process and calendar of due date milestones are developed in consultation with the State lead agencies and FS Region/Area/IITF and communicated by the FS Washington Office. The FS will ensure that national evaluation and prioritization criteria are communicated to the States and in a timely manner so that submitted projects adhere to strategic goals and objectives of FLP. Project selection steps are:

Step 1: Release Project Selection Calendar with Due Dates (See Appendix A for example) The project selection process and calendar of due date milestones are developed in consultation with the States and FS Regions/Area/IITF and communicated by the FS Washington Office.

Step 2: State Project Prioritization and Submission FLP project applications are accepted

by the State lead agency as outlined in the State's AON. The SFSCC reviews and evaluates applications according to the criteria identified in the State's AON, authorizing statute, and other relevant direction and policy, and provides recommendations to the State lead agency. Projects approved and prioritized by the State lead agency are forwarded to the FS Region/Area/IITF for funding consideration. Only projects submitted through this process will be deemed eligible. Each State will prepare a list of projects and enter or update its list for submission to the FS via the Forest Legacy Information System or other means as requested.

Step 3: Forest Service Regional Review FS Regions/Area/IITF will review submitted projects considering State priorities and national criteria. The purpose of this review is to improve project viability, facilitate the national project selection process and advance the strategic outcomes of the FLP. FS Regions/Area/IITF will submit projects to the FS Washington Office for funding consideration.

Step 4: National Review; Develop National Project List The FS Washington Office will develop a prioritized national project list by convening a panel. There are 3 purposes of the panel; 1) assure that all projects meet Congressional and Administration direction; 2) assure that projects meet national program goals; and 3) develop a National List of ranked projects. The composition of the panel shall be developed annually in consultation between the State lead agencies and the FS, and will be representative of geographic regions. Project evaluation and ranking is based on the following national core criteria; project readiness will be considered as well as other evaluation considerations developed in consultation with State lead agencies and FS Regions/Area/IITF. The national core criteria are:

- Important – The public benefits gained from the protection and management of the property including environmental values, and the economic and social aspects;
- Threatened – Conversion to nonforest uses is likely or imminent and will result in a loss of forest values and public benefits; and
- Strategic – Fits with a larger conservation plan, strategy, and initiative and enhances previous conservation investments.

States newly entering FLP will be given a "New-State start-up" preference for an initial FLP project. This is a placeholder for planning purposes and does not guarantee project funding. In order to receive the New State start-up project funds the State must have an approved AON and the project must meet national core criteria and the State's evaluation criteria and be submitted within the fiscal year that the placeholder is approved by Congress.

Step 5: Submit National FLP Project List to the Office of Management and Budget and to Congress

Each fiscal year, the FS Washington Office will submit a project list to the

Office of Management and Budget for funding consideration in the President's budget. Once the President's budget has been completed, the FS Washington Office will notify the appropriate House and Senate Committees and Subcommittees of the recommended projects for the upcoming Fiscal Year.

X. Program Fund Categories

Forest Legacy funds are allocated to one of three categories: Project Funds, Administration Funds, and AON Preparation Funds. FLP funds may not be used for monitoring and enforcement.

A. Project Funds Project funds are those used to directly purchase lands or interests in land joining the FLP. Project funds may be expended by the State lead agency or the FS, as applicable, to cover transaction costs, including but not limited to: appraisals and appraisal review, land surveys, closing costs, establishing baseline information, title work, purchase of title insurance, conservation easement drafting, and other real estate transaction expenses for those tracts. Project funds may also be expended to facilitate donations of land or interests in lands to a qualified and willing donee for FLP purposes, by paying for expenses directly related to the donation, including but not limited to, land surveys, conservation easement drafting, title work, and establishing baseline information. For an outright donation of a conservation easement or land, FLP program funds may not be used to pay for an appraisal. In the case of a partial donation of a conservation easement or land, an appraisal meeting Federal standards is required to determine the value of property. FLP funds may be used for appraisals on these partial donations. When Federal funds are used to purchase real property, including conservation easements, appraisal and acquisition work procedures must meet Federal standards.

B. Administration Funds Administrative funds are the portion of funds used for day-to-day program management at all levels. Administration funds may be used for a variety of activities, including FLP program administration, personnel and overhead, and all activities identified as eligible uses of project funds to prepare projects and potential projects. Forest Legacy funds for administration shall be kept to a minimum. As a goal, all attempts should be made to keep administration funds under 15 percent of the total funds appropriated.

C. AON Preparation Funds AON preparation funds may be made available to States to help defray the cost of preparing, or amending an AON.

XI. Process for Allocating Funds to Forest Service Regions/Area/IITF

Following passage of the annual appropriations bill, the FS Washington Office develops the Forest Legacy Program Direction and allocates funds to the FS Regions/Area/IITF for distribution. The allocation process differs for each fund category described below.

EXHIBIT "B"

A. Allocation of Project Funds Allocations to FS Regions/Area/IITF are based on the results of the national project selection process and the appropriations bill. Under the State grant option, FS Regions/Area/IITF will award grants to States for specific, identified projects.

B. Allocation of Administration Funds The FS Washington Office distributes administration funds to FS Regions/Area/IITF. Each FS Region/Area/IITF in consultation with the States requests these funds to meet their needs and the needs of the participating states in their Region/Area/IITF. Administration funds are also used by the FS Washington Office to fund program management functions. Administration funds will be granted to States under the State grant option separately from project funds.

C. Allocation of AON Preparation Funds The FS Washington Office distributes AON preparation funds to the States by way of FS Regions/Area/IITF. These funds are requested by FS Regions/Area/IITF to meet the needs of their States to develop new AONs or amendments.

XII. Redirection and Reprogramming of Funds

Due to the nature of real estate transactions, FLP projects may change in scope, cost or fail completely. These changes can result in unspent or excess funds for some projects while others may need additional funding to bring them to completion. In order to maximize the efficient and effective use of FLP project funding, the FS will either redirect or request reprogramming of funds. Redirection is a shift of funds from one congressionally approved project to one or more other congressionally approved project(s). Reprogramming is a shift of funds that exceeds an increase or decrease of 10% per project not to exceed $500,000 to an existing project, or shifting of any amount of funds to a project not previously approved by Congress.

Regional Redirection Process FS Regions/Area/IITF may redirect up to an increase or decrease of 10% per project not to exceed $200,000 of project funds that are excess or unspent from one project to one or more other Congressionally approved project(s) within the FS Region/Area/IITF which is underfunded and where there is a substantiated need (e.g. loss of other funding sources, appraisal documenting increased cost, etc.) to bring the project to completion. Project funds over $200,000, or those that cannot be redirected by the FS Region/Area/IITF, will be released for the national process. FS Regions/Area/IITF will notify the FS Washington Office before a redirection takes place and report these actions periodically. All funds from failed projects will be released for the national process.

National Redirection Process The FS Washington Office, through consultation with FS Regions/Area/IITF, may redirect up to an increase or decrease of 10% per project not to exceed $500,000 of project funds that are excess or unspent from one project to one or more congressionally approved project(s) which is underfunded and where there is a substantiated need (e.g. loss of other funding sources, appraisal documenting increased

cost, etc.) to bring the project to completion. In addition, when funds have not been spent or contractually obligated within two years of receipt of funds, they revert to the FS Washington Office via the appropriate FS Region/Area/IITF. The FS Washington Office will:

1. 1. Assess the extent of unspent or returned funds on a periodic basis;
2. 2. Facilitate selection and funding of underfunded projects not addressed by the regional process or between FS Regions/Area/IITF; and
3. 3. Notify Appropriations Subcommittees of any redirection action taken by the FS FS Regions/Area/IITF or FS Washington Office.

National Reprogramming Process The FS Washington Office, through consultation with FS Regions/Area/IITF, may request reprogramming by the Appropriations Subcommittees of unspent or returned funds to a project that requires more than an increase or decrease of 10% per project not to exceed $500,000 to complete. In addition, the FS Washington Office may request reprogramming by the Appropriations Subcommittees of unspent or returned funds to a project not previously approved by Congress. The FS Washington Office will:

1. 1. Determine the funds available for reprogramming on a periodic basis.
2. 2. Identify underfunded projects that cannot be addressed through the Regional Redirection Process and determine the priority for reprogramming.
3. 3. Recommend reprogramming to fund projects from the National Project List next in sequence in priority ranking to the extent practicable.
4. 4. Submit reprogramming requests to the Appropriations Subcommittees for approval.
5. 5. Allocate funds to projects approved for reprogramming.

XIII. FLP Cost Share Requirements

The CFAA directs that, to the extent practicable, the maximum Federal contribution for total program costs may not exceed 75 percent. To assure program-wide cost share goals are met, each project budget must include a minimum nonfederal contribution of 25 percent (See Appendix D for examples of cost share calculations). This nonfederal cost-share must meet Forest Legacy purposes. It may consist of: (1) the value of land, or interest in land, dedicated to the FLP that is not paid for by the Federal government; (2) nonfederal costs associated with program implementation; and (3) other nonfederal costs associated with a grant or other agreement that meets FLP purpose. The nonfederal cost-share must be documented, and in the case of a grant, must meet the timing, terms, and conditions of the grant. The cost-share can occur at any phase of the FLP including planning, developing future projects, acquisition, capital improvement, management, or administrative activities. When a grant is involved, the cost-share must occur within the life of a grant and meet all grant requirements. Federal requirements identify the grant period as beginning when the grant is formally awarded and ends after two years to ensure that the federal funds are spent promptly. However, a grant may receive a maximum extension to five years. Allowable costs shall be determined in accordance with the 7 CFR 3016, "Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments," and any amendments to this regulation

(See Appendix C for list of applicable Office of Management and Budget (OMB) Circulars and other regulations).

Donations of land or interests in land must be documented to count as part of the nonfederal cost-share. The title does not need to be transferred to the State or federal government in order for the donation to qualify as cost share. However, if in the future, the donated lands are conveyed or the rights or title are modified in a way that is inconsistent with the purposes of the FLP then the State must restore the cost share value dedicated in the grant agreement. The value of donations may be included as part of the nonfederal cost-share if all of the following are met:

1. 1. The donation contributes to the objectives and priorities of the State FLP as set forth in the AON;
2. All or part of the tract being donated must be within the boundaries of an FLA, and may include National Park, National Forest, National Wildlife Refuge, or other Federal land boundary, or within the boundaries of an area designated through an analogous State program with goals compatible with the FLP and be within an FLA;
3. The donor documents their desire that value of the interests may be used as cost share for the FLP project;
4. The donation of land or an interest in land must contain perpetual covenants to assure that the tract will be managed in a manner compatible with the goals for which the FLA was established;
5. The donee (holder of donated rights) is a unit of government or a non-profit conservation organization (land trust) that meets the eligibility requirements for holding a conservation easement established by the Internal Revenue Service and has as its purpose the management of lands or interests in land consistent with FLP purposes;
6. If the donation is in the form of a conservation easement then the deed needs to contain a provision that directs all of the easement holder's proceeds from a subsequent sale or exchange of interests in land be used in a manner consistent with the conservation purposes identified for the subject interests in lands;
7. The respective portion of the donation must not have been previously credited towards any Federal program's nonfederal cost share; and
8. The State lead agency approves the donation as contributing to the cost-share.

XIV. Acquisition of Lands or Interests in Lands

FLP acquisitions may be outright full fee purchases, or acquisition of development rights or other rights conveyed through a conservation easement. Except in the case of a full and complete donation of land or an interest in land, if any Federal funds are used in the acquisition of Forest Legacy tract the following shall apply:

1. Federal appraisal standards must be met, including appraisal review by a qualified Review Appraiser;
2. The landowner must be informed in writing of the market value and that sale of the property is strictly voluntary;
3. The landowner must be notified in writing that the property will NOT be purchased if negotiations do not result in amicable agreement;
4. Federal payment to the landowner for lands or interests in lands is not more than

the market value as determined by an appraisal meeting Federal appraisal standards;

5. The title acquired must be free of encumbrances inconsistent with the purposes of the FLP. Title insurance may be secured for the full value of the encumbered property, but is not an alternative to an acceptable title; and

6. If relocation is involved the requirements in the Uniform Relocation Assistance and Real Estate Property Acquisition Policies Act of 1970 (PL 91-646 or 42 U.S.C. 4601) must be followed. The FS will be advised in advance of any acquisition involving relocation.

7. In the case of acquisition of interested in lands, the development of a Forest Stewardship Plan or multi-resource management plan that has been approved by the landowner and the State Forester or designee and Baseline Documentation Report shall be prepared prior to project closing (See Appendix J for sample content and references).

All FLP acquisitions of lands or interest in lands are perpetual and therefore run with the land. Although any remaining interests held by the landowner may be subsequently conveyed, future owners are still bound by the terms and conditions of the conservation easement. At the same time, future owners shall retain full control of the rights that are not acquired by the FLP, and shall be subject only to those restrictions that the present landowner has conveyed to the Federal, State, or local government.

Compatible nonforest land uses (cultivated farmland, pasture, grassland, shrubland, open water, and wetlands) are desirable land uses in many FLAs. FLP funds should not be used for any property not meeting the State's definition of forested land in the AON, unless there is a written plan scheduling reforestation or afforestation. Programs to conserve farms, ranches and similar land uses may be used in conjunction with the FLP to protect properties where there are mixed forest and compatible nonforest uses.

Conservation easements are required to contain language pertinent to the purpose of the FLP and a reversionary provision to ensure the conservation investment of FLP into the future (Example clause language are found in Appendix I). During the development of tract specific conservation easements, a determination will be made as to whether the acquisition of mineral rights, prohibition on reserved areas, or an exclusion of the area that does not comply with FLP, would be necessary in order to protect the other rights that are being considered for acquisition. In some situations, it may be impossible to protect environmentally important forest areas pursuant to the purpose of the FLP without acquiring the mineral rights.

The FLP conservation easement holder (Federal, State or local government) is responsible to assure that baseline documentation contains all the information necessary to monitor, manage and enforce the easement. Where the conservation easement is a tax-deductible gift, and the owner retains rights to the property, the Internal Revenue Service (IRS) holds the donor responsible for providing sufficient baseline data "to establish the condition of the property at the time of the gift." (See Treas. Reg.§1.170A-14(g)(5)(i)). However, this does not eliminate the FLP need for baseline documentation.

EXHIBIT "B"

Baseline documentation describes or depicts a tract of land and its attributes on the day it becomes restricted by an easement. This documentation is required on all FLP tracts and is completed prior to project closing. Documentation of the property should include a map of the area drawn to scale showing all existing man-made improvements or incursions such as roads, buildings, fences or gravel pits; an aerial photograph of the property taken as close to the date the property is restricted as possible; and on-site photographs, especially of significant features. The above should be accompanied by narrative descriptions of tract attributes and other pertinent information.

States and landowners are encouraged to display the official FLP signs on the FLP property using the signs in accordance with Appendix K. The posting of FLP tracts helps promote public awareness, recognition and support for the program. Landowner permission should be secured before posting any signs. Costs associated with sign posting can be covered by FLP project or administration grants or States may use such expenses as FLP cost share. Signs should be inspected during the annual monitoring of the FLP tract and repaired when in poor condition.

FLP sign art and program logos may be used by FLP partners for items that contribute to the purpose of awareness (e.g. brochures, workshops, outreach efforts, posters, FLP information packets, web sites etc.)

XV. Appraisal and Appraisal Review

The FLP policy on appraisal is that all FLP acquisition of land or interests in land using Federal funds must comply with Federal appraisal standards contained in the publication entitled "Uniform Appraisal Standards for Federal Land Acquisitions: Interagency Land Acquisition Conference, 2000," as amended or updated. Appraisals and appraisal reviews may be conducted by any qualified appraiser meeting the minimum standards outlined in Appendix H.

The FLP will ensure high quality appraisal service and accountability to the program by:

. • Annual planning and coordination of appraisal work to allow for efficient allocation of resources.

□.• Requiring checks and balances:

a. States will ensure that qualified appraisers trained and competent in appraisal, appraisal review and knowledgeable of Federal standards will be used. The State may use State, contract or Federal appraisal or review services to meet this requirement.

b. States or the FS will review contract appraiser qualifications as stated in Appendix H before they are employed to conduct a FLP project appraisal or review.

c. The appraiser and identified review appraiser will engage in an initial consultation before the project appraisal takes place. The review appraiser will develop project specific appraisal instructions for the appraiser as a result of this consultation.

d. The FS will conduct spot checks of appraisal reviews to ensure quality and accuracy.

e. Forest Legacy funds can only be used to purchase lands and interests in land after the appraisal review confirms that the appraisal meets the *Uniform Appraisal Standards for Federal Land Acquisitions.* It is recommended that an offer not be made until the appraisal review is approved.

XVI. Conservation Easement Monitoring, Management, Record-Keeping & Enforcement

The governmental entity holding title to interests in land acquired under the FLP shall monitor and manage those interests in perpetuity. The holder may delegate or assign monitoring, management, and enforcement responsibilities over lands and interests in lands acquired under the FLP only to other Federal agencies or State or local government entities. Such delegation or assignment of responsibility shall be documented by a written agreement. The governmental entity responsible for monitoring, management and enforcement of the conservation easement may in turn delegate or assign management and monitoring authority to other parties, to include land trusts, conservation groups, and other governmental entities. Such delegation or assignment of authority shall be adequately documented and the FS shall be notified. The FS shall approve agreements involving any interests in lands held by the Federal Government prior to such delegation or assignment. Once interests in lands are acquired, the State lead agency, FS, and others as appropriate, may negotiate tract-specific Memorandums of Understanding (MOU) as necessary to specify management and monitoring responsibilities for the interests in lands.

Optimal management and monitoring of tracts in FLAs is based upon partnerships between landowners, private non-profit organizations owning or managing lands, and State and Federal officials. Land trusts and other private organizations will continue to manage and monitor their own easements and lands within designated FLAs, and while they may not manage government-owned interests in lands under the FLP, they may cooperate with or contract for monitoring and implement specific management activities. Management of federally owned interests in lands is reserved to the FS, but may be assigned to State or local governments, or another Federal agency through mutual agreement. Although delegable, enforcement actions for easements will generally be conducted by the easement holder, i.e., the State or the Federal Government.

Monitoring FLP conservation easements shall occur periodically, but not less than annually. Monitoring consists of visual inspection of the property, documented by a written report to explain the condition of the property at time of inspection. Any material departure from the baseline documentation report or Forest Stewardship Plan should be noted. The easement holder should immediately address any violation of the conservation easement with the landowner. The landowner should have the opportunity to correct the breach. After a reasonable time period (e.g. 30 days), if the breach is not corrected, enforcement action may be taken, including but not limited to, legal means. The unit of government holding the conservation easement has the initial responsibility to enforce the conservation easement. See Appendix G, Real Estate Record Keeping for suggestions on what information should be kept.

The State or easement holder shall promptly notify any future FLP tract owner of the FLP and the origin and requirements of the conservation easement.

The Forest Stewardship Plans covering the tract shall be reviewed periodically and updated as needed. If there is a change in land ownership, then the Forest Stewardship Plan needs to be reviewed, and updated as needed.

XVII. Landowner Participation

Landowner participation in the program is voluntary and consists of two elements:

1. Conveyance of lands and interests in lands to achieve the purpose of the FLP;
2. Preparation and periodic updates of a Forest Stewardship Plan or a multi-resource management plan. The landowner and the State Forester or designee must approve the plan prior to signing the acquisition of the easement. The plan shall include provisions to meet land conservation objectives of the FLP. The plan shall be kept current and updated as needed. Modifications of the plan must be agreed to by the State lead agency. A plan is not needed if the lands are purchased in fee. (See Appendix F for sample content of a Forest Stewardship Plan)

Landowners may submit an application and property information (See Appendix E) to the State lead agency to enroll their land or interests in lands in the FLP according to the process described in the AON. All owners of eligible forestlands within the designated FLA, and meeting the minimum Eligibility Criteria or other application requirements described in the AON, are eligible to submit an application.

For a landowner to participate in the program, it is not required that their tracts be completely forested. (see definition of "Nonforest Uses" and "Reserved Areas") However, priority will generally be given to tracts that are currently forested or are identified to be forested in the landowner Forest Stewardship Plan or multi-resource management plan.

The FLP respects the rights of private property holders. Under no circumstances shall the right of eminent domain be used for the unwilling "taking" of any private property rights. Traditional forest uses such as forest management activities, including timber management, and outdoor recreation opportunities are deemed consistent with purposes of the FLP and are encouraged on FLP tracts when consistent with the State's AON and the conservation purposes for FLP tract acquisition.

The FLP adheres to language contained in Section 14 of the CFAA, Statement of Limitation: "This Act shall not authorize the Federal Government to regulate the use of private land or to deprive owners of land of their rights to property or to income from the sale of property, unless such property rights are voluntarily conveyed or limited by contract or other agreement. This Act does not diminish in any way the rights and responsibilities of the States and political subdivisions of States." Purchase or donation

of rights does not relieve landowners of regulations that would otherwise apply. The FS has no jurisdiction to make tax determinations or render advice as to the tax implications of transactions. Since tax implications differ from person to person, landowners should be encouraged to seek independent counsel from local assessors, tax lawyers, or accountants.

XVIII. Land Trust Participation

Land trusts are nonprofit organizations that protect land by working with landowners wishing to donate or sell fee title or conservation easements to maintain conservation values associated with the land. Land trusts can have an important role to play in the FLP. The following considerations apply to land transactions between the Federal Government/States and land trusts:

1. Land trusts cannot execute contracts for acquisition of interests in lands on behalf of the Federal /State Government. Land trusts may work as intermediaries for eventual Federal/State acquisition, but without an accepted land purchase option and contract with the FS there is no guarantee of Federal acquisition. No pass-through transactions shall be done without prior consultation with the FS/State.
2. With approval of the State lead agency, the FS, the land trust or the donating landowner, lands and interests in lands acquired by land trusts (pursuant to Final Guidelines Part 1, Section XIII) may be counted toward the nonfederal cost-share contribution, provided that the interests in lands permanently contribute to the FLP.
3. If a land trust proposes a pass-through transaction to the FLP it must assure that terms and conditions in the deed or conservation easement are reviewed and approved in advance by the State lead agency and/or the FS.
4. The monitoring of easements within FLAs may be performed by land trusts in accordance with the umbrella MOU for the FLP in that State and individual MOUs for specific tracts established between the State and the land trust organization.
5. Other appropriate and beneficial roles of land trusts in relation to the FLP may include: participation on the SFSCC; recruitment and facilitation of FLP projects; buyer of tracts or easements of proposed, but unfunded FLP projects; facilitators of local FLP efforts; and performing tract monitoring and management activities.

PART 2 - STATE GRANT PROGRAM

The State lead agency elects the State grant option of the FLP, in writing, to the appropriate FS Region/Area/IITF.

When a State elects the State grant option, all FLP acquisitions shall be transacted by the State with title vested in the State or a unit of State or local government. There are two exceptions:

1. Donations where the donor may wish to make a donation to a land trust, local, or Federal Government and the donee agrees to accept the donation, and to manage the

lands or interests in lands in perpetuity for FLP purposes; and
2. At the request of the State and at the discretion of the FS, the FS may acquire individual tracts or multiple tracts within a specified FLA, with title vested in the

U.S. in accordance with Part 3 of these guidelines.

I. Grants

If a State elects the optional State grant option, the FS will provide a Federal grant to the State to carry out the FLP, including the acquisition by the State of lands and interests in lands. Grants must be consistent with the uniform administrative requirements established in 7 CFR 3016. States will generally be reimbursed for costs incurred with cash advances limited to the minimum amounts needed and timed to be in accord only with the actual, immediate cash requirements of the State in carrying out the FLP. The timing and amount of cash advances shall be as close as is administratively feasible to the actual cash outlay by the State for direct program costs and the proportionate share of any allowable indirect costs.

A. Conditions of the Grant
1. States must submit annual performance and financial status reports. A final performance report and financial status report are required prior to close out of the grant.
2. Funds appropriated for the FLP shall not be included in consolidated-payment grants made under authority of Section 12 of the CFAA.
3. The State shall maintain current and complete financial records in accordance with requirements contained in the latest Federal Aid Manual and OMB Circular (See Appendix C).

B. Eligible Activities The following activities are eligible uses of funds granted to States for the FLP; however, in most cases costs incurred prior to issuance of the grant cannot be reimbursed:
1. Purchase of lands or interests in lands from willing sellers for inclusion in the FLP;
2. Facilitation of donations of lands or interests in lands to a qualified and willing donee for FLP purposes;
3. Program administration expenses limited to indirect costs and direct acquisition related expenses for lands and interests in lands acquired under Forest Legacy authority;
4. Establishment and documentation of baseline conditions and development of a Forest Stewardship Plan for a conservation easement; and
5. AON Planning and amendment.

The following uses of Forest Legacy funds are not allowed as part of a State grant:
1. Management of acquired lands or interests in lands including, monitoring of conservation easements,
2. Enforcement actions, and

3. Payment for appraisals of donated property when the donation represents the full and total value.

C. Availability of Funds Project funds for any fiscal year shall be available to the State for two years from the time they are obligated in a FS grant to the State in order to insure that Federal funds are spent promptly to acquire FLP projects. However, a grant may have a maximum duration of five (5) years to allow for nonfederal cost sharing to occur. During the 5-year life of the grant, it can be amended annually, as needed, and funds from a new fiscal year added to the grant, consistent with the requirement that the funds be expended within two years of the time of obligation. In no case can funds be obligated or expended beyond the 5-year life of the grant.

II. Acquisition of Lands and Interests in Lands by States

All Forest Legacy acquisitions including the acquisition of lands or interests in land shall be made in accordance with Federal appraisal and acquisition standards and procedures. The interests in land acquired for Forest Legacy shall be adequate for Forest Legacy purposes and be perpetual. Title to such lands or interests in lands will be vested in the State or unit of State government. These lands or interests in lands will be managed and administered for goals consistent with Forest Legacy conservation purposes by State agencies or their assigns. The State agencies are responsible for all monitoring and management of conservation easements and management of fee simple properties.

Lands and interests in land located within a FLA and simultaneously within other Federal boundaries (e.g. national forest, national park, or national wildlife refuge) are eligible for the FLP provided that the responsible Federal agency concurs with the FLP State acquisition. If a State has passed legislation that extinguishes claims to or restrictions on real property, the State shall use all available authorities, including that of acting as an agent of the U.S., to achieve the purposes of section 7(K)(2) of the CFAA.

III. Reversion of Funds for Forest Legacy Inconsistency

In the event it is determined, by the State lead agency, that it is no longer desirable to hold lands or interests in lands acquired with Federal funding and those lands are conveyed, exchanged, or otherwise disposed of, after providing notice to the FS, the State shall:

1. Reimburse the FS for the current market value in proportion to the original Federal investment; (said reimbursements to be used to further the purposes of the FLP); or
2. Exchange for other FLP eligible lands or interests in lands of at least equal market value and of reasonably equivalent location, with public purposes that equal or exceed those of the disposed tract, with FS approval.

Items 1 and 2 identified above must be included in deeds or conservation easements of all FLP tracts as well as in the FS grant to the State. Appendix I includes suggested language for conservation easements and deeds.

PART 3 - FEDERAL ACQUISITION PROGRAM GUIDELINES

I. Federal Acquisition Process

In the furtherance of the purposes of the FLP, the State lead agency with involvement of the SFSCC and the FS will review property owner applications, prioritize tracts, obtain State approval, and submit properties to the appropriate FS Region/Area/IITF for funding. Upon approval for funding, the FS will proceed to acquire from willing sellers conservation easements and/or other interests in land including fee acquisition.

Federal Acquisition Procedures must be followed when Federal funds are used to complete an acquisition of land or interests in land using FLP authority. They are:

1. Federal appraisal standards must be met;
2. The landowner must be informed of the market value and that sale of the property is strictly voluntary;
3. The landowner must be notified in writing that the property will NOT be purchased if negotiations do not result in an amicable agreement;
4. Federal payment to the landowner for lands or interests in lands is not more than the market value determined under #1;
5. Assure title is free and unencumbered relative to the purposes of the FLP; and
6. If relocation is involved the requirements in PL 91-646 (42 U.S.C. 4601) must be followed and the FS must advise the landowner prior to the acquisition.

Certain lands are not eligible for the Federal ownership option under FLP authority because other authorities and funding sources are available for acquisition of lands or interests in lands within these federally established areas. These include lands or interests in lands located within National Forests, National Parks, National Wildlife Refuges, or other Federal Government boundaries. Proximity to Federal lands or the inclusion of Federal lands within a proposed FLA does not disqualify an area for program eligibility.

Federal laws governing public lands do not apply to private property rights not acquired by the Federal Government from willing private landowners. Interests in lands retained by private landowners, not conveyed to the Federal Government under the FLP, are subject to the same requirements of the Endangered Species Act (ESA) that existed prior to their participation in the FLP. Conveyance of interests in lands to the Federal Government neither enhances nor diminishes the landowner's responsibility under the ESA. Any interests in lands acquired by the Federal Government under the FLP shall be subject to the same requirements of the ESA as are other Federal lands.

EXHIBIT "B"

II. Memorandum of Understanding (MOU) for Coordination of the FLP

An MOU will be used to coordinate the FLP where Federal acquisition option resulting in Federal ownership of FLP acquisitions occurs. The MOU will define and facilitate partnerships between the State lead agency, FS, and other participating entities in implementing the program, acquiring interests in lands, and sharing the costs of the program. The MOU shall determine how costs are shared between parties, including administrative, management, monitoring, and capital improvement expenses. The terms of a MOU will determine which party is responsible for costs incurred following the project's five-year cost-share write off period.

If individual Forest Legacy tract-MOUs are needed, they become an addendum to the State level "umbrella" MOU. The umbrella MOU between the State lead agency and the FS shall be developed following the Secretary's approval of the State's AON and the establishment of the State's FLP.

The FS/State MOU is for the purpose of specifying roles and responsibilities for implementing the program, and may address the following items:

1. Costs and Funding:

□.a. Identify direct and indirect costs expected to be incurred in establishing the FLP, and acquiring and administering interests in lands during the first five years of the program. Revise or renew these cost estimates as appropriate.

□.b. Identify and propose sources of cost-share matches.

2. Planning:

□.a. Document the amount of work required to complete the AON and identification of FLAs.

□.b. Define a process for revising existing landowner Forest Stewardship Plans, or multi-resource forest management plans.

□.c. Identify how specific tract acquisition needs and priorities shall be established by the State.

3. Acquisition:

□.a. Identify who is responsible for title work, appraisals, surveys, and similar pre-acquisition work.

□.b. Define a process for determining the value of donated interests in lands.

4. Management:

□.a. Define responsibilities for management of interests in lands acquired or dedicated to the program.

□.b. Identify possible activities needed to enhance, restore, or maintain resources to meet the intent of the program and general responsibilities in carrying out such activities.

5. Administration:

□.a. Estimate the staff-work required to implement the Program.

□.b. Define responsibilities for processing applications to the FLP.
□.c. Establish procedures for monitoring and enforcement the terms of reserved interest deeds and easements and identify who will be responsible.
□.d. Identify responsibilities for periodic reports summarizing the achievement of FLP goals in the State.

III. Payment in Lieu of Taxes (PILT)

Where the Federal Government under the FLP acquires lands in fee, the Federal Government will pay PILT to the local taxing authority. No PILT will be paid on conservation easements.

IV. Transition to State Grant Option Program

If a State elects the State Grant Option, and there are active cases being pursued by the FS, all parties (FS, State, and landowner) may agree to transfer the case to the State. If agreement to transfer is reached, then the value of the lands or interests in lands comprising the project may be transferred to the State by a FS grant. To facilitate projects transferred to the State, the FS may provide the State with copies of any appraisals, appraisal reviews, title reports, option contracts and other pre-acquisition materials for lands that have been under negotiation by the FS.

APPENDIX A- Example of a Project Selection Calendar

This flowchart outlines the basic FLP project selection process.

EXHIBIT "B"

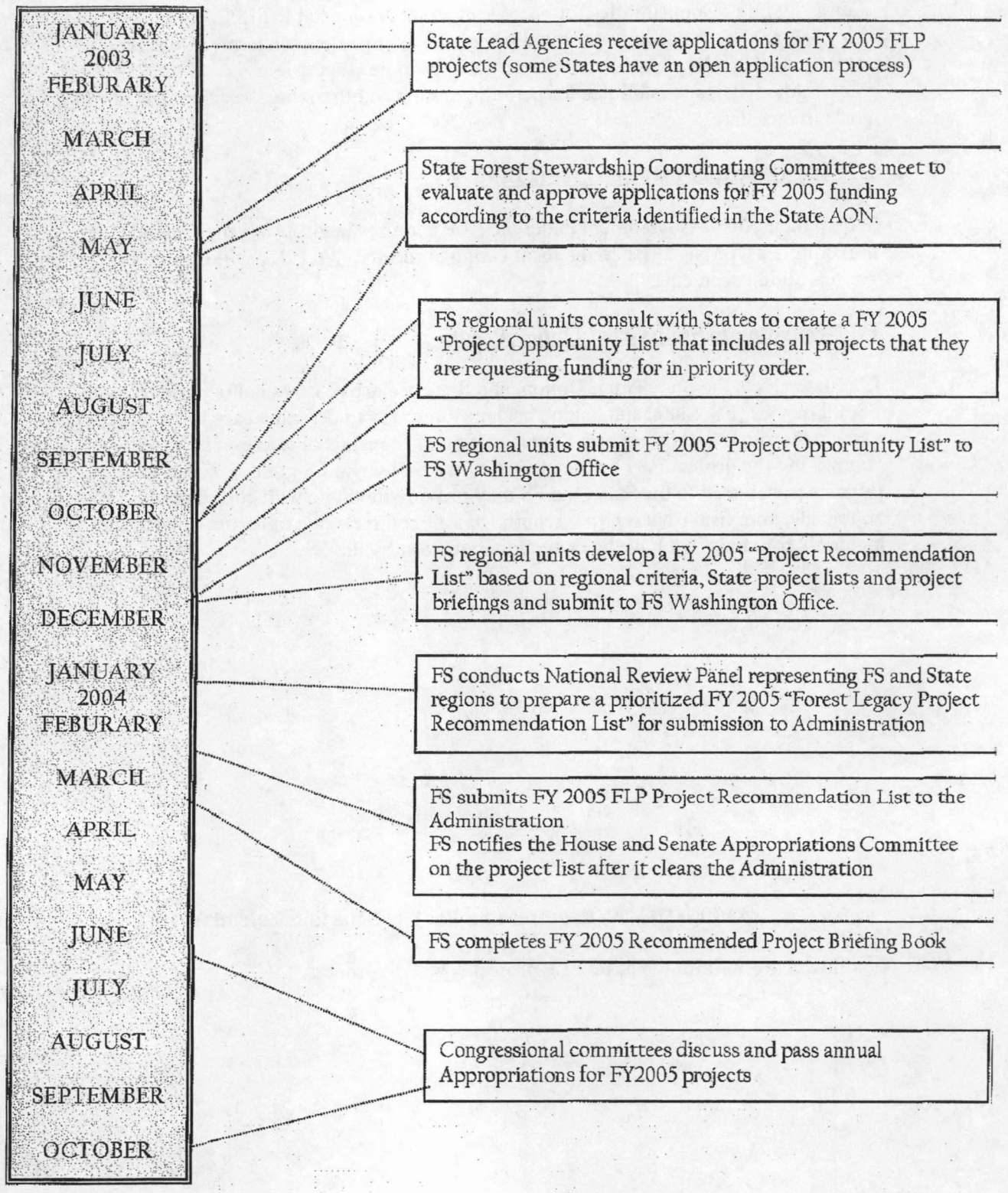
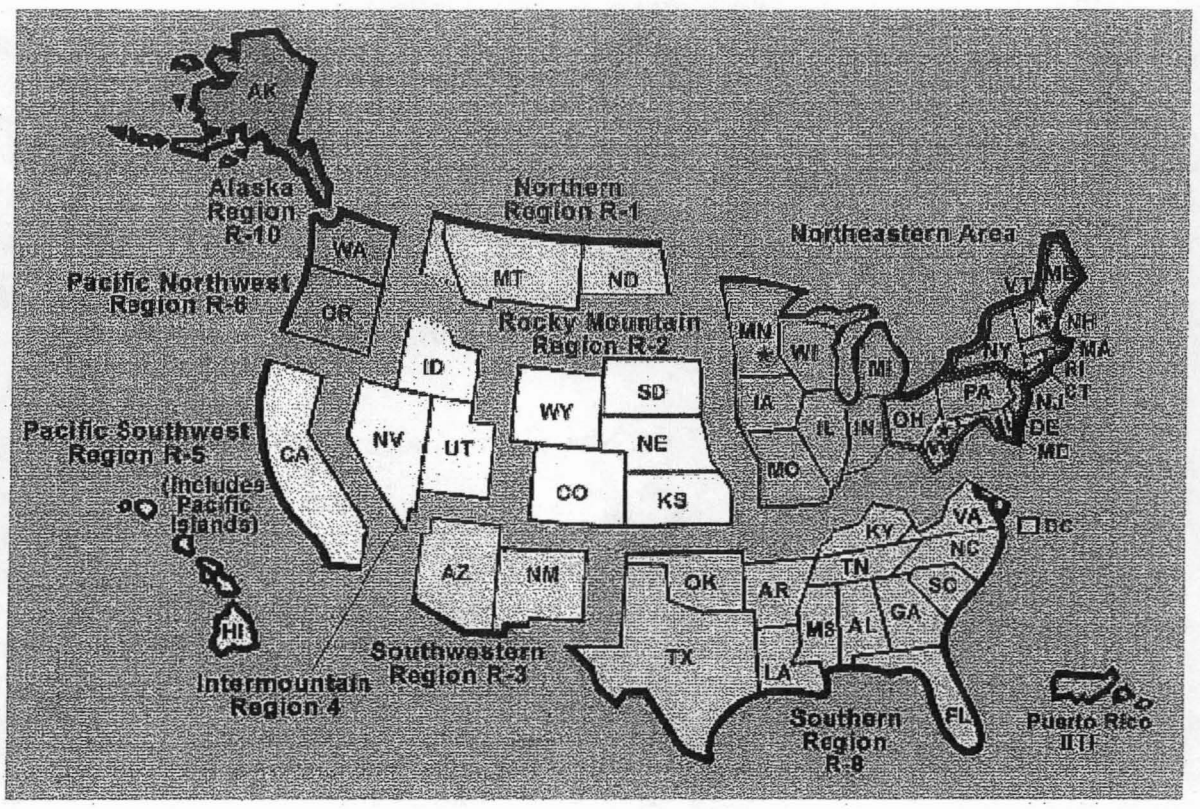

JANUARY 2003
FEBURARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY 2004
FEBURARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
State Lead Agencies receive applications for FY 2005 FLP projects (some States have an open application process)
State Forest Stewardship Coordinating Committees meet to evaluate and approve applications for FY 2005 funding according to the criteria identified in the State AON.
FS regional units consult with States to create a FY 2005 "Project Opportunity List" that includes all projects that they are requesting funding for in priority order.
FS regional units submit FY 2005 "Project Opportunity List" to FS Washington Office
FS regional units develop a FY 2005 "Project Recommendation List" based on regional criteria, State project lists and project briefings and submit to FS Washington Office.
FS conducts National Review Panel representing FS and State regions to prepare a prioritized FY 2005 "Forest Legacy Project Recommendation List" for submission to Administration
FS submits FY 2005 FLP Project Recommendation List to the Administration
FS notifies the House and Senate Appropriations Committee on the project list after it clears the Administration
FS completes FY 2005 Recommended Project Briefing Book
Congressional committees discuss and pass annual Appropriations for FY2005 projects

EXHIBIT "B"

APPENDIX B- Map of the Forest Service Regions/Area/IITF



National Association of State Foresters' (NASF) Geographic Regions:

North: All States within the Forest Service's Northeastern Area.

South: All States within the Forest Service's Southern Region (R-8) and International Institute of Tropical Forestry (IITF).

West: All States within the Forest Service's Northern (R-1); Rocky Mountain (R-2); Southwestern (R-3); Intermountain (R-4); Pacific Southwest (R-5); Pacific Northwest (R-6); and Alaska (R-10) Regions.

APPENDIX C- Office of Management and Budget (OMB) Circulars and Other Regulations

Any award of Federal financial assistance under these guidelines will be subject to the following or its most recent update:

1. OMB Circular A-102 (10/7/1994, amended 8/29/1997), "Grants and Cooperative Agreements with State and Local Governments"
2. OMB Circular A-87 (5/4/1995, amended 8/29/1997), "Cost Principles for State, Local, and Tribal Governments" as implemented by Departmental Regulation 7 CFR 3016, "Uniform Administrative Requirements for Grants and Cooperative Agreements to

State and Local Governments"
3. OMB Circular A-110 (11/19/1993, amended 09/30/1999), "Uniform Administrative Requirements for Grants and Other Agreements with Institutions of Higher Education, Hospitals and Other Non-Profit Organizations"
4. OMB Circular A-122 (6/1/1998), "Cost Principles for Non-Profit Organizations"
5. OMB Circular A-133 (06/24/1997), "Audits of States, Local Governments, and Non-Profit Organizations" as implemented by Departmental Regulation 7 CFR 3050, "Audits of State and Local Governments" OMB Circular A-89 (8/17/1984), "Catalog of Federal Domestic Assistance"
6. 7 CFR 3017, Government Debarment and Suspension (Nonprocurement) and Government-wide Requirements for Drug-Free Workplace (Grants), and
7. 7 CFR 3018, New Restrictions on Lobbying.
8. 7 CFR 3019, Uniform administration requirements (Higher education, hospitals, and non-profit organizations"

APPENDIX D- Examples of Cost Share Calculations

Equation for Calculating Cost Share Requirement

(Federal FLP Share) X (0.333) = the minimum Non-Federal Contribution

OR

(Total Project Costs) X (0.75) = the maximum Federal Contribution

Principals to Guide Calculating the Cost-Share Requirements

- To calculate the cost share requirement, the Program Manager should use the Federal FLP contribution, and not the total project costs.
- The cost share requirement should be at least 33.3% of the total Federal FLP contribution towards the project, which will equal at least 25% of the total FLP project (Federal FLP contribution plus cost share).
- The Federal contribution (Forest Service's FLP plus all other Federal contributions) cannot exceed 75% of the total project costs (all cost requirements to complete the project, including Federal and non-Federal contributions).
- The non-Federal cost share portion cannot be used as cost share for another Federal program that also requires a cost share.

Example 1- The FLP is going protect Jane Smith's 3,000 acres tract. The total cost of protecting that land is $1 million.

Total Project Costs	*Federal FLP Contribution*	*Non-Federal FLP Contribution*	*Other Federal Contribution*	*Other non-Federal Contribution*

$1,000,000	$750,000	$250,000	$0	$0

- Federal contribution cannot exceed $750,000; therefore, the Federal contribution is not greater than 75% of the total project costs.
- The non-Federal cost share requirement is at least $250,000; therefore, FLP funds are adequately cost shared.

Example 2- John Doe Ranch is planning to conserve 6,500 acres of land. The total cost of protecting the land is $4 million. The Federal contribution, through FLP, will be $1,000,000, and the non-Federal contributors will provide $3,000,000, which includes a cost-share component for the FLP.

Total Project Costs	*Federal FLP Contribution*	*Non-Federal FLP Contribution*	*Other Federal Contribution*	*Other non-Federal Contribution*
$4,000,000	$1,000,000	$333,000	$0	$2,667,000

- Federal contribution cannot exceed $3,000,000; therefore, the Federal contribution is not greater than 75% of the total project costs.
- The non-Federal cost share requirement is at least $333,000; therefore, FLP funds are adequately cost shared.

Example 3-ABC Tree Company is planning to conserve 8,300 acres of land. Both theForest Service's FLP and the U.S. Fish and Wildlife Service (FWS) are contributing funds toward the project. Non-Federal money has been secured to cover the non-Federal cost share requirements for the FLP and FWS requirements, as well as to pay for additional project costs.

Total Project Costs	*Federal FLP Contribution*	*Non-Federal FLP Contribution*	*Other Federal Contribution*	*Other non-Federal Contribution*
$4,000,000	$1,000,000	$333,000	$1,000,000	$1,667,000

- Federal contribution cannot exceed$3,000,000; therefore, the Federal contribution is not greater than 75% of the total project costs.
- The non-Federal cost share requirement is at least $333,000; therefore, FLP funds are adequately cost shared.
- FLP cost share component cannot be the same as the FWS cost share component.

APPENDIX E- Information to Facilitate Landowner Participation

Landowners who wish to participate in the program may be asked to provide the following information.

1. Name, address and phone number of applicant landowner.
2. All other owners of record for this tract, and their addresses.
3. Name, address and phone number of authorized agent representing landowner(s) if applicable.
4. Location of property.
5. If the landowner intends to reserve rights to forestry uses or other resource

management activities, a copy or reference to the State approved landowner Forest Stewardship Plan or multi-resource management plan.

6. List of the significant scenic, natural, recreational, wildlife, timber and other resource values contained on the property.

7. Identification of all dams, dumps or waste disposal sites on the property.

8. Signed statement giving the FS and State lead agency permission to enter the property for review and appraisal purposes.

9. Legal description.

10. List any encumbrances or liens existing on the property including, but not limited to contracts, leases, or outstanding rights not of record.

11. Copy of plat or survey map of the property, if existing. If only a portion of the property is being offered, identify it on a plat showing the portion offered in the context of the entire tract.

12. Tract acreage and total number of acres of forests and cleared/open land.

13. List of existing permanent improvements on the tract, including houses, barns, lakes, ponds, dams, wells, roads, and other structures, and total number of acres occupied by improvements.

APPENDIX F- Sample Content of a Forest Stewardship Plan

Below is information from the Forest Stewardship Program's *National Standards and Guidelines*. Please also refer to the Forest Stewardship Program's *Planning for Forest Stewardship: A Desk Guide* as well as States' Statewide Forest Stewardship Plans for additional information on Forest Stewardship Plans.

Landowner Forest Stewardship Plans must:

- be prepared or verified, as meeting the minimum standards of a forest stewardship plan, by a professional resource manager.
- identify and describe actions to protect, manage, maintain and enhance relevant resources listed in the law (soil, water, range, aesthetic quality, recreation, timber, water, and fish and wildlife) in a manner compatible with landowner objectives.
- be approved by the State Forester or a representative of the State Forester.
- involve the landowner in the plan development by setting clear objectives and should understand clearly the completed plan.

A well prepared plan will:

- Clearly state landowner objectives.
- Have a cover page.
- Provide for authorship and/or signature lines within the document.

The plan preparer should consider and evaluate resource elements present and include a brief description of those that are applicable and their importance to the ownership. Resource elements to be considered are:

- Soil Interpretations
- Water
- Range

- Aesthetic Quality
- Recreation
- Timber
- Fish
- Wildlife
- Forest Health
- Archeological, Cultural and Historical Sites
- Wetlands
- Threatened and Endangered Species

Management recommendations, or where appropriate, alternative strategies should be provided for those resource elements described. Prescriptions or treatments should be integrated and stand or site specific. An ownership map drawn to scale, or photo, to include vegetation cover types, stream and pond location with a legend will enable the landowner to implement the plan.
Landowners' understanding may be improved by including activity summaries and appendices. Appendices might include:

- Description of assistance available and incentive programs
- Educational materials
- A glossary of terms
- An explanation of applicable Federal, State and /or county regulatory programs, especially as they apply to:

a. Archeological, cultural and historical sites.
b. Wetlands.
c. Threatened and Endangered Species.

These last three items are covered by legislation other than the Cooperative Forestry Assistance Act of 1978, as amended by title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 2101, et seq.), but must be considered for Federally funded programs.

The professional resource manager should discuss the Forest Stewardship Plan with the landowner, following completion, to assure understanding.

APPENDIX G- Real Estate Record Keeping

Since Forest Legacy acquisitions are perpetual, record keeping is important. Each State shall maintain permanent records for all Forest Legacy properties. The following information is recommended to be maintained by the conservation easement holder:

A. Landowner information (name, address, phone)
B. Nomination form (including notification to landowner that property will not be purchased if negotiations do not result in amicable agreement)
C. Landowner Inspection Consent Agreement
D. Baseline documentation

E. Option agreement
F. Deed of Conservation Agreement
G. Additional warranty deeds, covenants, restrictions
H. Title Insurance Policy
I. Appraisal
J. Appraisal review
K. Forest Stewardship Plan or equivalent
L. Notification of county or local government
M. Closing statement
N. Copies of check or documentation of EFT or other form of payment
O. Copies of grant reimbursement or expenditure

The following items should also be maintained as part of the record:
1. Landowner correspondence
2. Evaluation criteria
3. Tracking/documentation of negotiation steps
4. State Forest Stewardship Coordinating Committee recommendation
5. Press release
6. Monitoring records/history

APPENDIX H- Required Qualifications of an Appraiser or Review Appraiser

A. Appraiser - In order to be a qualified appraiser for purposes of FLP appraisals, an individual must be:

1. a Federal land acquisition agency staff appraiser who
a. is certified as a general appraiser in compliance with OMB Bulletin 92-06, and
b. has completed training in application of the December 2000 edition of *Uniform Appraisal Standards for Federal Land Acquisitions (UASFLA)** approved for appraiser continuing education credit in the State where the appraiser is certified, or

2. a nonfederal staff or fee appraiser who
a. is certified as a general appraiser in the state where the appraised property is located, or can obtain reciprocity or a temporary practice permit in the state where the appraised property is located, and
b. has, within the past 10 years, completed at least the minimum classroom hours of non-duplicative education prescribed for the certified general real property appraiser classification by the Appraisal Standards Board of The Appraisal Foundation, and
c. has completed at least 12 self-contained or summary appraisal reports of properties similar in scope and complexity to the appraised property in the preceding three years, and
d. has completed training in application of the December 2000 edition of *Uniform Appraisal Standards for Federal Land Acquisitions* approved for appraiser continuing education credit in the state where the appraiser is certified.

EXHIBIT "B"

The qualified appraiser shall prepare an appraisal report in compliance with the *Uniform Appraisal Standards for Federal Land Acquisitions* and supplemental written appraisal instructions issued by the client. Federal land acquisition agencies are the member agencies of the Interagency Land Acquisition Conference.

B. Review Appraiser- In order to be a qualified review appraiser for purposes of FLP appraisals, an individual must be:

1. a Federal land acquisition agency staff appraiser who
a. is certified as a general appraiser in compliance with OMB Bulletin 92-06, and
b. holds specific delegated authority to review and approve or recommend appraisals for agency use, and
c. has completed training in application of the December 2000 edition of UASFLA* approved for appraiser continuing education credit in the State where the reviewer is certified, or

2. a nonfederal staff or fee appraiser who
a. is certified as a general appraiser in the State where the appraised property is located, or can obtain reciprocity or a temporary practice permit in the state where the appraised property is located, and
b. has, within the past 10 years, completed at least the minimum classroom hours of non-duplicative education prescribed for the certified general real property appraiser classification by the Appraisal Standards Board of The Appraisal Foundation and at least 32 classroom hours of approved training in appraisal review, or otherwise demonstrates competency in appraisal review in compliance with the Competency Rule of the *Uniform Standards of Professional Appraisal Practice (USPAP)*, and
c. has completed at least 12 self-contained or summary appraisal reports of properties similar to the appraised property in the preceding three years or at least 12 technical appraisal review reports for appraisal reports of properties similar in scope and complexity to the appraised property in the preceding three years, and
d. has completed training in application of the December 2000 edition of *Uniform Appraisal Standards for Federal Land Acquisitions* approved for appraiser continuing education credit in the state where the reviewer is certified.

The qualified review appraiser shall prepare a technical appraisal review report that includes a determination of whether the appraisal report under review complies with the *Uniform Appraisal Standards for Federal Land Acquisitions*.

Federal land acquisition agencies are the member agencies of the Interagency Land Acquisition Conference.

*The seminar, *Federal Land Exchanges and Acquisitions: Appraisal Issues and Applications*, offered by the American Society of Farm Managers and Rural Appraisers and the Appraisal Institute is the only acceptable substitute for UASFLA training.

EXHIBIT "B"

APPENDIX I- Requirements and Suggestions for Conservation Easements and Deeds

The Purpose and Authority and Reversion clauses are required in all FLP easements and deeds. Below are examples of language that States have used to meet that requirement:

A. Purpose and Authority Clause

Example 1:

WHEREAS, the Conservation values of the Property are consistent with the goals of the Forest Legacy Program and the establishment of this conservation easement will provide public benefits by:

preventing future conversions of forest land and forest resources; protecting and enhancing water quality and water supplies; protecting wildlife habitat and maintaining
habitat connectivity and related values to ensure biodiversity; protecting riparian area;
maintaining and restoring natural ecosystem functions; and maintaining forest sustainability and the cultural and economic vitality of rural communities.

WHEREAS, the specific Conservation Values of the Property are documented in an inventory of relevant features of the Property. The data and explanatory text are presented in the Baseline Documentation Report, dates _____, which consists of reports, maps, photographs, and other documentation that the parties agree to provide.

This Easement acquisition is authorized by the Cooperative Forestry Assistance Act of 1978, as amended by section 1217 of the Food, Agricultural, Conservation and Trade Act of 1990 (104 Stat. 3528; 16 U.S.C. Section 2103c).

Example 2:

The purpose of this easement is to effect the Forest Legacy Program in accordance with the provisions of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. – 2103c) as amended, on the herein described land, which purposes include protecting environmentally important forest areas that are threatened by conversion to non-forest uses and for promoting forest land protection and other conservation opportunities. The purposes also include the protection and preservation of important scenic, cultural, fish, wildlife and recreational resources, riparian areas, and other ecological values, and to ensure that the Property is available for the sustainable and cost effective harvesting of forest products in a silviculturally sound manner, all of which meet the objectives of the Forest Legacy Program. The purposes also include encouragement of management for and the production of economically sustainable and commercially viable forest products consistent with the other purposes of this easement and also include the long-term protection of the Conservation Property's capacity to

produce economically valuable forestry products, and the encouragement of management of the property for industrial or commercial forestry only if consistent with the other purposes of this Conservation Easement.

The Parties agree that the purpose of this easement is also to assure that the Property herein described as Schedule "A" and hereby encumbered as set forth in Schedule "B" will be retained forever in its existing natural, scenic and forested condition and to prevent any use of the Property that will significantly impair or interfere with the conservation values of the Property. The Grantor intends that this easement will confine the use of the Property to such activities specifically enumerated herein which are consistent with the overall purposes of the easement by protecting the following particular values of the easement area: specifically the scenic, cultural, fish, wildlife and recreational resources, riparian areas and similar ecological values.

Example 3:

WHEREAS, the clearly delineated open space conservation goals and objectives as stated in Forest Legacy Program pursuant to Section 1217 of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 USC Section 2103C) which was created "to protect environmentally important private forest lands threatened with conversion to non-forest uses" has awarded a Forest Legacy grant in to the Grantors for purchase of a portion of the value of the Easement herein conveyed for a conservation easement on forestal, agricultural, and open space land.

Example 4:

The purpose of this easement is to effect the Forest Legacy Program in accordance with the provisions of Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 U.S.C. 2103c) on the herein described land, which purposes include protecting environmentally important forest areas that are threatened by conversion to nonforest uses and for promoting forest land protection and other conservation opportunities. The purposes also include the protection of important scenic, cultural, fish, wildlife and recreational resources, riparian area, and other ecological values.

Example 5:

The purpose of this conservation easement is to restrict the exercise of all development rights, residential, commercial or otherwise, on the easement area and to protect the scenic and recreational values of said easement area from conversion to non-forest uses while at the same time allowing for the use of the area for commercial forestry and public recreation purposes consistent with the stated purposes, standards and general intent expressed in Title XII of the Food, Agriculture, Conservation and Trade Act of 1990 (16 USC 2103c) and the requirements of Section 7 for the Forest Legacy Program.

B. Reversion Clause:

EXHIBIT "B"

The Easement Holder acknowledges that this Easement was acquired with Federal funds under the Forest Legacy Program (P.L. 101-624; 104 Stat. 3359) and that the interest acquired cannot be sold, exchanged, or otherwise disposed, except as provided in Section 5.A, unless the United States is reimbursed the market value of the interest in land at the time of disposal. Provided, however, the Secretary of Agriculture may exercise discretion to consent to such sale, exchange, or disposition upon the State's tender of equal valued consideration acceptable to the Secretary.

APPENDIX J- Sample Content for Baseline Documentation

The following list has been modified from the Checklist included in the Land Trust Alliance and Trust for Public Land's *The Conservation Easement Handbook* (1988).

1. Cover Page
- including name and location of property, signature of the author/collector and date

2. Table of Contents

3. Owner Acknowledgement of Condition (see Treas. Reg. Section 1.170A-14(g)(5)(i)(D).

4. Background Information
- Ownership information (name, address, and phone number of property owner)
- Historical information on the donation/acquisition (brief chronological description of events that led to the protection of the property)
- Summary of easement provisions (specific prohibitions, restrictions, retained rights, as derived from the language of the easement document)
- Purpose of easement
- Evidence of the significance of the protected property, as established either by the government policy (include copies of documents) or by the long-term protection strategy developed by the grantee
- Corporate or agency resolution accepting gift (minutes of the meeting at which a gift is accepted or acquisition approved are adequate)

5. Legal Condition
- A copy of the signed, recorded easement document
- An assessor's parcel map
- A clear title statement or preliminary title report, noting any liens against the property that could compromise its natural qualities or invalidate the easement
- Copies of any other relevant easements or water rights associated with the property

6. Ecological Features
- A general description of the ecological features that the easement seeks to protect, such as forest and plant communities, soil characteristics, and habitat.
- The Forest Stewardship Plan should be used as a guide to determine what information is needed.
- An inventory of rare, endangered, and/or threatened species and habitat found on the property

. • Reports from wildlife biologists or other specialists that document the status of significant natural elements

7. Agricultural Features

. • Intensity of grazing (can be determined by experts and expressed in "animal units" per acre) and farming

. • Level of pesticide use

8. Scenic Features

. • Official policies citing property's scenic value

. • Number of people who frequent nearby public places (roads, trails, parks) from which they can view property

9. Archeological, Cultural and Historical Features

• Archeological, cultural and historical sites and resources found within the property, with a focus on those resources that the easement seeks to protect.

10. Human Created Features

. • Improvements (structures, trails, fences, wells, power lines, pipelines, irrigation systems, etc.)

. • Recreation/tourism attractions

. • Trespass damage and disturbed land (stray animals, introduced species evidence of vehicular trespass, etc.)

11. Photographs

. • Aerial photos, if appropriate

. • On-site photos (be sure to record key photo points, record distance and azimuth from structures or other fixed points, and sign and date all photos)

12. Maps

. • A state map showing easement location

. • An 8 ½" X 11" section of a local road map showing easement location

. • The largest scale U.S. Geological Survey topographical map available (usually at a scale of 1:24,000, called a 7-1/2 minute scale), showing easement boundaries

13. Survey

• Surveys generally are not required, but may be helpful

EXHIBIT "B"

For additional Information on Baseline Documentation:

Land Trust Alliance. 2001. *Working Forest Conservation Easements.*

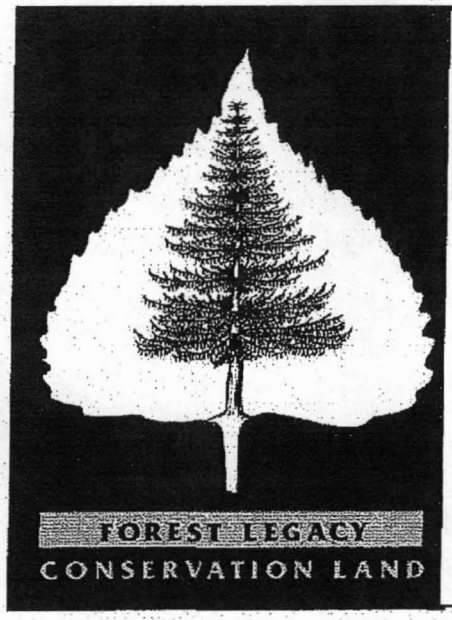
Land Trust Alliance and Trust for New Hampshire Lands. 1991. *The Conservation Easement Stewardship Guide.*

Land Trust Alliance and Trust for Public Land. 1988. *The Conservation Easement Handbook.*

APPENDIX K- Sample Graphics and Signs

The following are sample graphics for the Forest Legacy Program that can be used for signs, newsletters, articles, and other Forest Legacy Program related documents.

EXHIBIT "B"



Optional Text Box that can include:

- *Reference to FLP;*
- *Description of land conservation;*
- *Identify contact information;*
- *Address public access;*
- *Include participants' logos; or*
- *Other items.*

Exhibit "C"

FILED

ALAN MURAKAMI 2285
NATIVE HAWAIIAN LEGAL CORPORATION
1164 Bishop Street, Suite 1205
Honolulu, Hawaii 96813
Telephone: (808) 521-2302

2002 AUG 26 AM 10: 12

C. OKAWA, CLERK
THIRD CIRCUIT COURT
STATE OF HAWAII

JAMES M. DOMBROSKI 3622
LAW OFFICES OF JAMES M. DOMBROSKI
P.O. Box 751027
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STEVEN C. MOORE Pro Hac Vice
NATIVE AMERICAN RIGHTS FUND
1506 Broadway
Boulder, Colorado 80302
Telephone: (303) 447-8760
Attorneys for Plaintiff
PELE DEFENSE FUND

IN THE CIRCUIT COURT OF THE THIRD CIRCUIT

STATE OF HAWAII

PELE DEFENSE FUND, Plaintiff, vs. THE ESTATE OF JAMES CAMPBELL, DECEASED; W.H. MCVAY AND P.R. CASSIDAY, in their fiduciary capacity as Trustees under the Will and the Estate of James Campbell, Defendants.	CIVIL NO. 89-089 (Hilo) (Declaratory Judgment/Injunction) FINAL JUDGMENT; EXHIBITS "A" AND "B" Trial Date: August 2, 1994 Judge: Hon. Riki May Amano

FINAL JUDGMENT

Pursuant to the Findings of Fact and Conclusions of Law entered herein on AUG 26 2002, this court hereby enters JUDGMENT finally resolving all claims as to all

I hereby certify that this is a full, true and correct copy of the original on file in this office.

Clerk, Third Circuit Court, State of Hawaii

parties in favor of Plaintiff Pele Defense Fund (hereinafter PDF) and against the Estate of James Campbell as follows:

1. The Estate of James Campbell, its Trustees and each of their respective agents, employees, officers, heirs, personal representatives, successors, assigns, and beneficiaries, including successors in interest to 27,785.89 acres of land situate in the Puna District of the County of Hawai'i, State of Hawai'i (hereafter, the "land"), as described in the attached Exhibit "A", are permanently enjoined from excluding the following persons from entering the undeveloped portions of the land and using the developed portion for reasonable access to the undeveloped portions, (the developed areas are defined on Exhibit B attached hereto), to perform customarily and traditionally exercised subsistence and cultural practices:

(a) Hawaiian subsistence or cultural practitioners who are descendants of the inhabitants of the Hawaiian Islands prior to 1778;

(b) Person or persons accompanying Hawaiian subsistence or cultural practitioners described in (a); or

(c) Persons related by blood, marriage or adoption to Hawaiian subsistence or cultural practitioners described in (a).

2. For purposes of liability, all persons listed above are not invitees of the owner of the land.

3. Notwithstanding that this judgment includes a "permanent" injunction, the Estate of James Campbell and successor owners of the land, are not barred from and may seek to develop the undeveloped portions of the land consistent with applicable law; and PDF may oppose further development by lawful means.

4. The owner of the land shall give PDF notice of any and all proposed future development prior to application for any state or county permits, or the initiation of any development-related activity that does not require such permits. On January 1 of each calendar year, PDF shall inform the owner of the land of the name(s) and address of its designated officer(s) for purposes of this notice.

5. PDF shall submit a monitoring plan consistent with this Judgment to the owner of the land within six (6) months after entry of this Judgment. If the parties are unable to agree on the terms of the monitoring plan, either one or both parties may request Court instructions.

6. The Court shall retain jurisdiction to enforce this Judgment and the permanent injunction. If enforcement is necessary, any party in violation of the terms herein may be subject to contempt of court and sanctions, including but not limited to the payment of costs and reasonable attorneys' fees.

7. This judgment constitutes the final resolution of the all claims against all parties. There are no other outstanding claims or defenses which have been left unresolved.

DATED: Hilo, Hawaii, AUG 26, 2002.

Riki May Amano
Judge of the above-entitled Court

APPROVED AS TO FORM:

Gary G. Grimmer
Robert E. Strand
Attorneys for Defendant Trustees of the
Campbell Estate
1470125.2

STATE OF HAWAII
SURVEY DIVISION
DEPT. OF ACCOUNTING AND GENERAL SERVICES
HONOLULU

C.S.F. No. 20,315

December 13, 1985

PORTIONS OF GOVERNMENT LANDS OF
MAKUU, KAOHE, KAIHU, KEHENA, KAPAAHU AND KAMAILI

PARCEL A

Puna, Island of Hawaii, Hawaii

Beginning at the west corner of this parcel of land and on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 47,769.67 feet South and 8228.41 feet West, thence running by azimuths measured clockwise from True South:-

1.	240° 05' 12"	24,288.19 feet	along Land Court Application 1053;
2.	345° 23' 30"	1348.57 feet	along the remainder of Government Lands;
3.	313° 00'	1221.60 feet	along the remainder of Government Lands;
4.	330° 16'	4682.10 feet	along the remainder of Government Lands;
5.	262° 03'	1960.70 feet	along the remainder of Government Lands;
6.	290° 02'	627.40 feet	along the remainder of Government Lands;
7.	314° 28'	4581.80 feet	along the remainder of Government Lands;
8.	314° 47'	744.40 feet	along the remainder of Government Lands;
9.	314° 12'	735.30 feet	along the remainder of Government Lands;
10.	315° 31'	1825.53 feet	along the remainder of Government Lands;
11.	40° 41'	13.81 feet	along the north side of 20-Foot Road;

EXHIBIT "A"

L. A. 20,315

December 13, 1985

12. 338° 15' 14.99 feet along the west side of 20-Foot Road;

13. 60° 05' 12" 25,840.22 feet along Parcel B of Government Lands;

14. 140° 23' 16,220.18 feet along Parcel B of Government Lands to the point of beginning and containing an AREA OF 9,012 ACRES.

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

By: Raymond S. Nakamura
Raymond S. Nakamura
Land Surveyor

pt

Compiled from CSF 4777,
CSF 18,637 and Govt.
Survey Records.

50185-RV-3

STATE OF HAWAII
SURVEY DIVISION
DEPT. OF ACCOUNTING AND GENERAL SERVICES
HONOLULU

C.S.P. No. 20,316

December 13, 1985

PORTIONS OF GOVERNMENT LANDS OF
MAKUU, KAOHE, KAIMU, KEHENA, KAPAAHU AND KAHAILI

PARCEL B

Puna, Island of Hawaii, Hawaii

Beginning at the west corner of this parcel of land and at an angle on the south boundary of Land Court Application 1053, the coordinates of said point of beginning referred to Government Survey Triangulation Station "OLAA" being 55,748.70 feet South and 22,096.90 feet West, thence running by azimuths measured clockwise from True South:-

1.	240°	05'	12"	16,000.00 feet	along Land Court Application 1053;
2.	320°	23'		16,220.18 feet	along Parcel A of Government Lands;
3.	240°	05'	12"	25,840.22 feet	along Parcel A of Government Lands;
4.	338°	15'		3262.76 feet	along the west side of the 20-Foot Road;
5.	340°	23'		19.26 feet	along the west side of the 20-Foot Road;
6.	342°	31'		250.51 feet	along the west side of the 20-Foot Road;
7.	337°	27'		156.17 feet	along the west side of the 20-Foot Road;
8.	347°	14'		271.04 feet	along the west side of the 20-Foot Road;
9.	348°	38'		331.85 feet	along the west side of the 20-Foot Road;
10.	353°	51'		125.10 feet	along the west side of the 20-Foot Road;
11.	359°	30'		1278.10 feet	along the west side of the 20-Foot Road;

60185 RV.3

C.S.P. No. 20,316

December 13, 1985

12.	358°	59'	2128.77 feet	along the west side of the 20-Foot Road;
13.	332°	38'	221.69 feet	along the west side of the 20-Foot Road;
14.	315°	33'	287.92 feet	along the west side of the 20-Foot Road;
15.	258°	17'	9.45 feet	along the south side of the 20-Foot Road;
16.	352°	29'	6915.35 feet	along Parcel C of Government Lands;
17.	56°	27'	1460.60 feet	along Lots 3-B and 3-A of Upper Kaimu Homesteads;
18.	39°	38'	3534.10 feet	along Lot 3-A of Upper Kaimu Homesteads, Grant 6571 to K. Kamakani, Grant 6330 to S. Kamelamela and Grant 6328 to D. Kamelamela;
19.	53°	04'	10,520.90 feet	along Government Lands;
20.	53°	31' 30"	9863.30 feet	along Grant 9275 to H. M. Holt, et al., Trustees under the Will and of the Estate of James Campbell, Deceased;
21.	148°	00'	4100.00 feet	along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
22.	116°	00'	8150.00 feet	along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo;
23.	126°	59'	25,105.30 feet	along R.P. 8030, L.C.Aw. 8559-B, Ap. 14 to William C. Lunalilo, to the point of beginning and containing an AREA OF 16,843.891 ACRES.

Excepting and reserving therefrom all existing trails within the above-described Parcel B.

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

By: Raymond S. Nakamura
Raymond S. Nakamura
Land Surveyor

pt

Compiled from CSF 18,647
and other Govt. Survey
Records.

SD185-RV-3

STATE OF HAWAII
SURVEY DIVISION
DEPT. OF ACCOUNTING AND GENERAL SERVICES
HONOLULU

C.S.P. No. 20,317

December 13, 1985

PORTIONS OF GOVERNMENT LANDS OF
KAMAILI, KEHENA AND KIKALA

PARCEL C

Puna, Island of Hawaii, Hawaii

Beginning at the east corner of this parcel of land, on the south boundary of Royal Patent 4475, Land Patent 8199, Land Commission Award 7713, Apana 13 to V. Kamamalu and at the north corner of Grant 7365 to J. K. Pau, the coordinates of said point of beginning referred to Government Survey Triangulation Station "KALIU" being 115.60 feet South and 9325.70 feet West, thence running by azimuths measured clockwise from True South:-

1.	46° 00'	982.00 feet along Grant 7365 to J. K. Pau;
2.	85° 00'	652.00 feet along Grant 7365 to J. K. Pau;
3.	58° 45'	1050.00 feet along Grant 7365 to J. K. Pau;
4.	73° 30'	1005.00 feet along Grant 7547 to Wm. K. Kaliihoomalu;
5.	45° 46'	1197.50 feet along Grant 7547 to Wm. K. Kaliihoomalu;
6.	139° 03'	50.08 feet along the north side of 50-Foot Road;
7.	45° 46'	1064.16 feet along the west side of 50-Foot Road;
8.	16° 10'	2051.31 feet along the west side of 50-Foot Road;
9.	38° 34'	1319.67 feet along the west side of 50-Foot Road;
10.	323° 16'	2381.65 feet along the south side of 50-Foot Road;
11.	270° 00'	981.59 feet along the south side of 50-Foot Road;

50185 RV-3

C.S.P. No. 20,317

December 13, 1985

12. 316° 30' 1493.59 feet along the south side of 50-Foot Road to the northwest side of Upper Puna Road;

13. Thence along the northwest side of Upper Puna Road, the direct azimuth and distance being:
27° 43' 20" 4458.54 feet;

14. 55° 41' 15" 171.71 feet along the northwest side of Upper Puna Road;

15. Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 150.00 feet, the chord azimuth and distance being:
79° 01' 15" 118.82 feet;

16. 102° 21' 15" 518.59 feet along the northwest side of Upper Puna Road;

17. Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 250.00 feet, the chord azimuth and distance being:
77° 01' 15" 213.94 feet;

18. 51° 41' 15" 284.74 feet along the northwest side of Upper Puna Road;

19. Thence along the northwest side of Upper Puna Road on a curve to the right with a radius of 475.00 feet, the chord azimuth and distance being:
55° 01' 15" 55.24 feet;

20. 58° 21' 15" 354.39 feet along the northwest side of Upper Puna Road;

21. Thence along the northwest side of Upper Puna Road on a curve to the left with a radius of 450.00 feet, the chord azimuth and distance being:
50° 46' 15" 118.77 feet;

22. 135° 50' 1250.91 feet along Grant 7731 to L. K. Swain;

23. 157° 30' 3467.50 feet along Grant 7593 to Louisa Swain, Grant 7478 to L. E. Blaisdell and the northeast end of 50-Foot Road;

24. 127° 35' 2173.00 feet along Lot III-B of Upper Kaimu Homesteads;

25. 172° 29' 6915.35 feet along Parcel B of Government Lands;

26. 258° 17' 139.94 feet along the south side of 20-Foot Road;

27. 244° 12' 614.60 feet along the south side of 20-Foot Road;

C.S.F. No. 20,317

December 13, 1985

28.	195°	08'	397.80 feet along the south side of 20-Foot Road;
29.	254°	12'	783.69 feet along the south side of 20-Foot Road;
30.	254°	05'	1202.89 feet along the south side of 20-Foot Road;
31.	254°	48'	283.02 feet along the south side of 20-Foot Road;
32.	242°	35'	876.64 feet along the south side of 20-Foot Road;
33.	245°	28'	581.05 feet along the south side of 20-Foot Road;
34.	242°	17'	539.85 feet along the south side of 20-Foot Road;
35.	246°	20'	20.81 feet along the south side of 20-Foot Road;
36.	240°	31'	1658.87 feet along the south side of 20-Foot Road;
37.	240°	47'	707.62 feet along the south side of 20-Foot Road;
38.	309°	05'	1550.70 feet along R.P. 4475, R.P. 6883, L.P. 8200, L.C.Aw. 7713, Ap. 14 to V. Kamamalu;
39.	296°	22'	753.00 feet along R.P. 4475, R.P. 6883, L.P. 8200, L.C.Aw. 7713, Ap. 14 to V. Kamamalu;
40.	286°	00'	2750.00 feet along R.P. 4475, L.P. 8199, L.C.Aw. 7713, Ap. 13 to V. Kamamalu to the point of beginning and containing an AREA OF 1930 ACRES, MORE OR LESS.

Excepting and reserving therefrom all existing trails within the above-described Parcel B.

SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

By: Raymond S. Nakamura
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Land Surveyor

Compiled from CSF 9446
and Govt. Survey Records.

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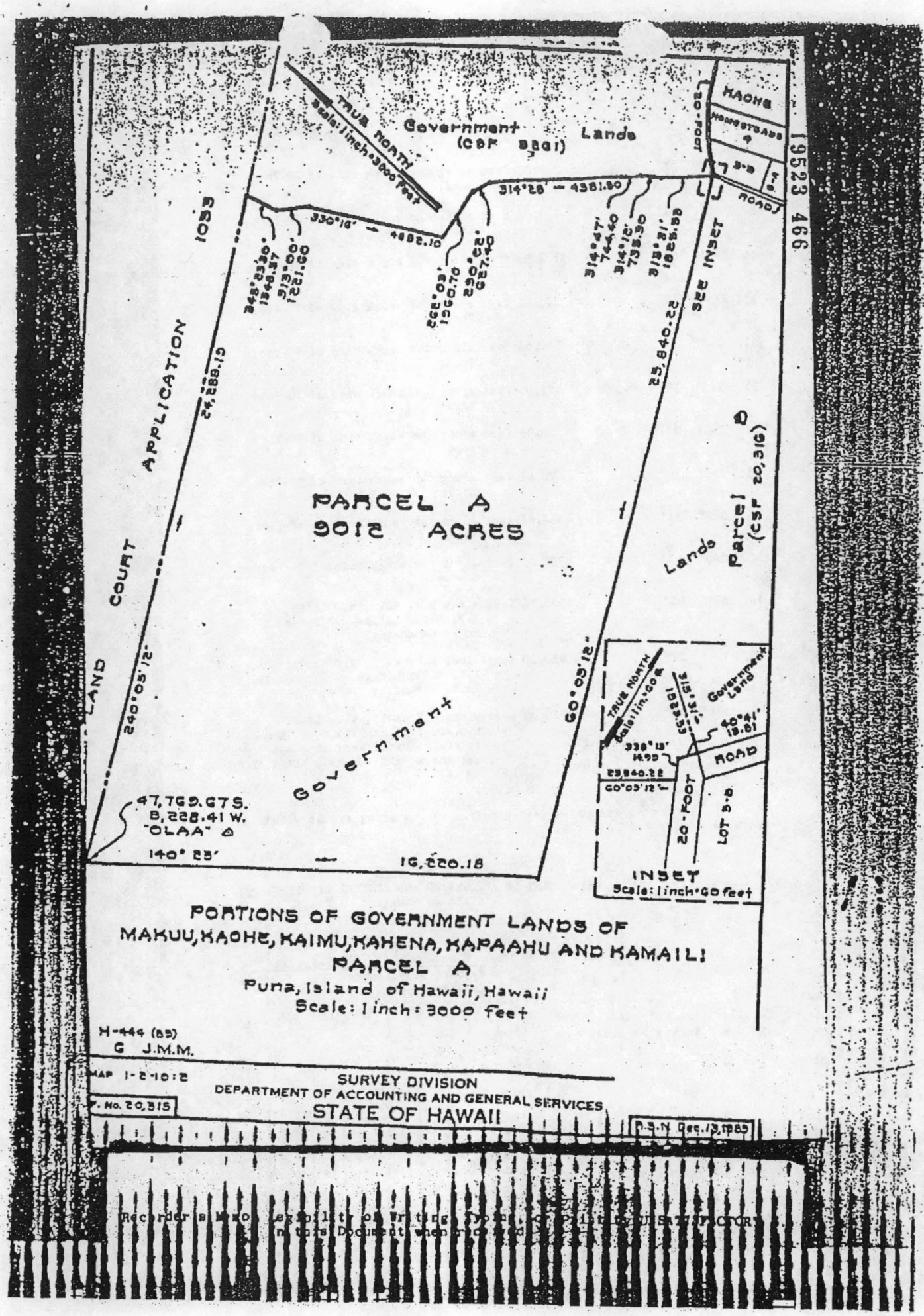
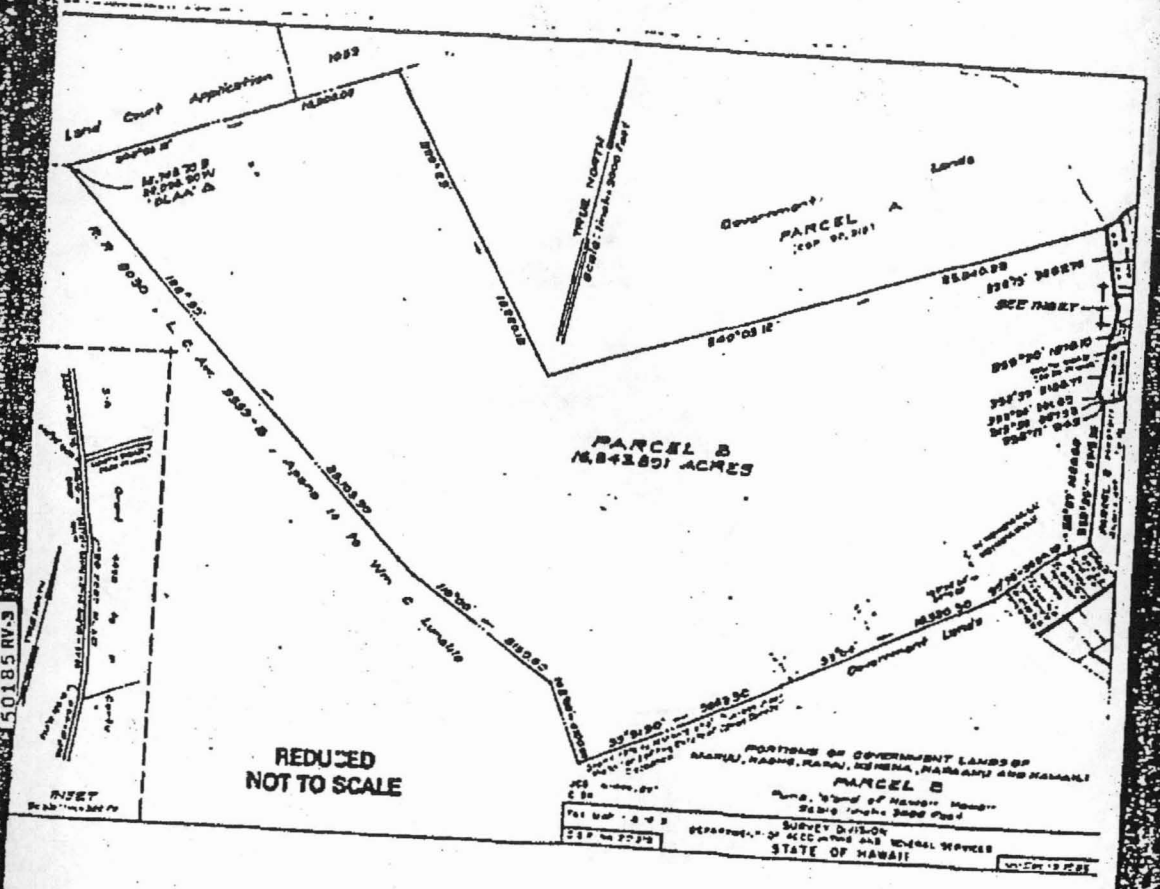


PORTIONS OF GOVERNMENT LANDS OF
MAKUU, KAOHE, KAIMU, KAHENA, KAPAAHU AND KAMAILI
PARCEL A
Puna, Island of Hawaii, Hawaii
Scale: 1 inch = 3000 feet

H-444 (85)
G J.M.M.
MAP 1-2-10:2
SURVEY DIVISION
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII
P. No. 20,315
R.S.N. Dec. 13, 1985

19523 467



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Recorder's Memo: Legibility of Writing, Typing or Printing Unsatisfactory in this Document when Received.

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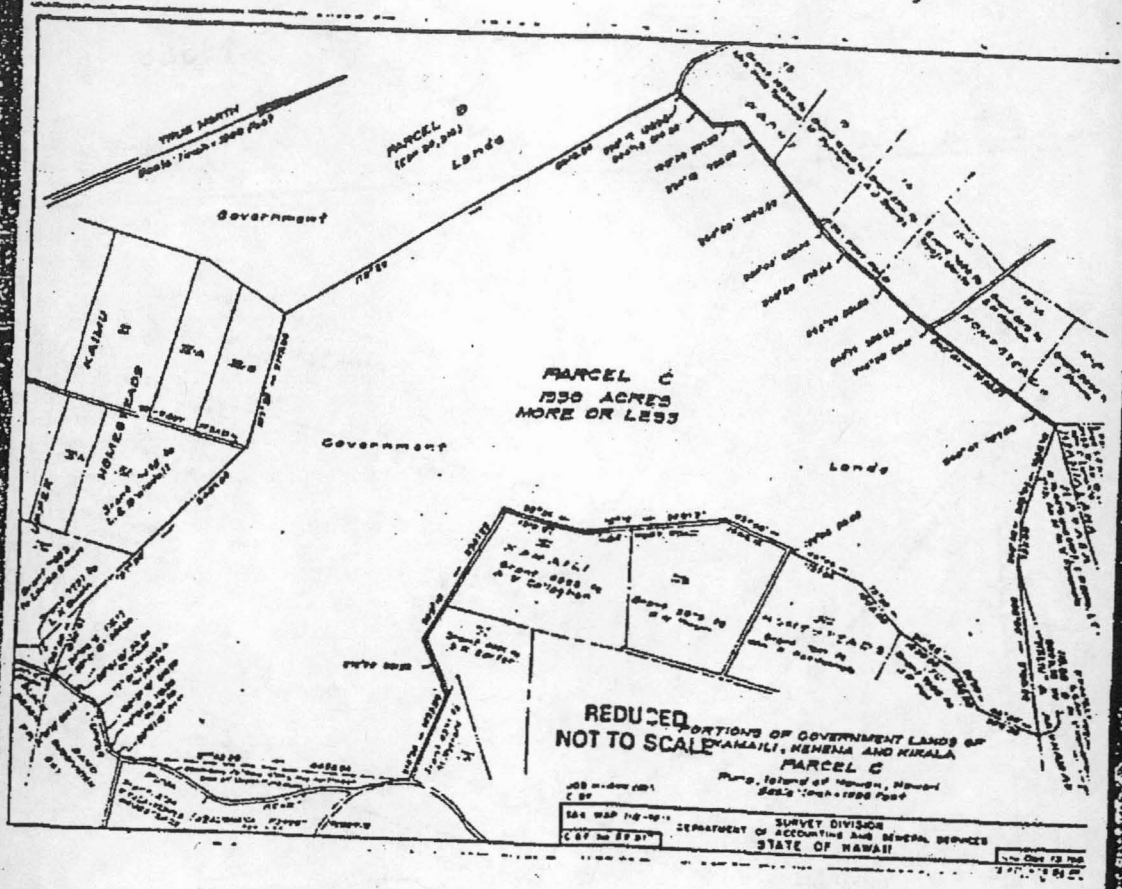

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EXHIBIT "B"

DEVELOPED AREAS

The developed areas as of January 1, 2001, are the access road, geothermal drill sites and areas cleared for geothermal drill sites.

EXHIBIT "D"

Wao Kele o puna Operations and Management Funding Scenarios:

1). Minimal operations cost:

Minimal Signage for safety	$3000
ANNUALLY:	
- Basic peripheral Invasive Species Control-	$2000/yr
- DLNR Vehicle Usage-	$2000/yr
- Fire Pre-suppression-	$1000/yr
- Endangered Species Mgmt-	$5000/yr
- Basic Field Staff Time-	$4000/yr
- Misc. expenses- cement, etc. as needed)	$3000/yr (fence materials, helicopter time,
- Access Improvements- and reforestation of cleared areas)	$8000/yr (trails and roads maintenance/repairs
- Administrative costs -	$10,000
- Utilization of DOFAW Base yard Office space	$5,000
- Minimal enforcement	$10,000
TOTAL	**$53,000**

2). Improved operations cost:

Minimal Signage for safety	$3000
Basic peripheral Invasive Species Control-	$2000/yr
- DLNR Vehicle Usage-	$2000/yr
- Fire Pre-suppression-	$1000/yr
- Endangered Species Mgmt-	$5000/yr
- Basic Field Staff Time-	$4000/yr
- Misc. expenses- cement, etc. as needed)	$3000/yr (fence materials, helicopter time,
- Access Improvements- and reforestation of cleared areas)	$8000/yr (trails and roads maintenance/repairs
- Administrative costs -	$10,000
- Utilization of DOFAW Base yard Office space	$5,000
- - Minimal enforcement	$10,000
- Fire suppression capacity	$10,000
- Management plan development	$30,000
- EA's	$20,000
- Expansion of hunting program	$10,000
- Establishment of permit system	$5,000
TOTAL	**$75,000 + $53,000 = $128,000**

3). **Ideal Operations Costs:**

Minimal Signage for safety	$3000
Basic peripheral Invasive Species Control-	$2000/yr
- DLNR Vehicle Usage-	$2000/yr
- Fire Pre-suppression-	$1000/yr
- Endangered Species Mgmt-	$5000/yr
- Basic Field Staff Time-	$4000/yr
- Misc. expenses-	$3000/yr (fence materials, helicopter time,
cement, etc. as needed)	
- Access Improvements-	$8000/yr (trails and roads maintenance/repairs
and reforestation of cleared areas)	
- Administrative costs -	$10,000
- Utilization of DOFAW Base yard Office space	$5,000
- Minimal enforcement	$10,000
- Fire suppression capacity	$10,000
- Management plan development	$30,000
- EA's	$20,000
- Expansion of hunting program	$10,000
- Establishment of permit system	$5,000
- Coordinator	$50,000
- Designated vehicle for Coordinator	$30,000
- Adequate enforcement	$20,000
TOTAL	**$100,000 + $75,000 + $53,000 = $228,000**
GRAND TOTAL	**$228,000**